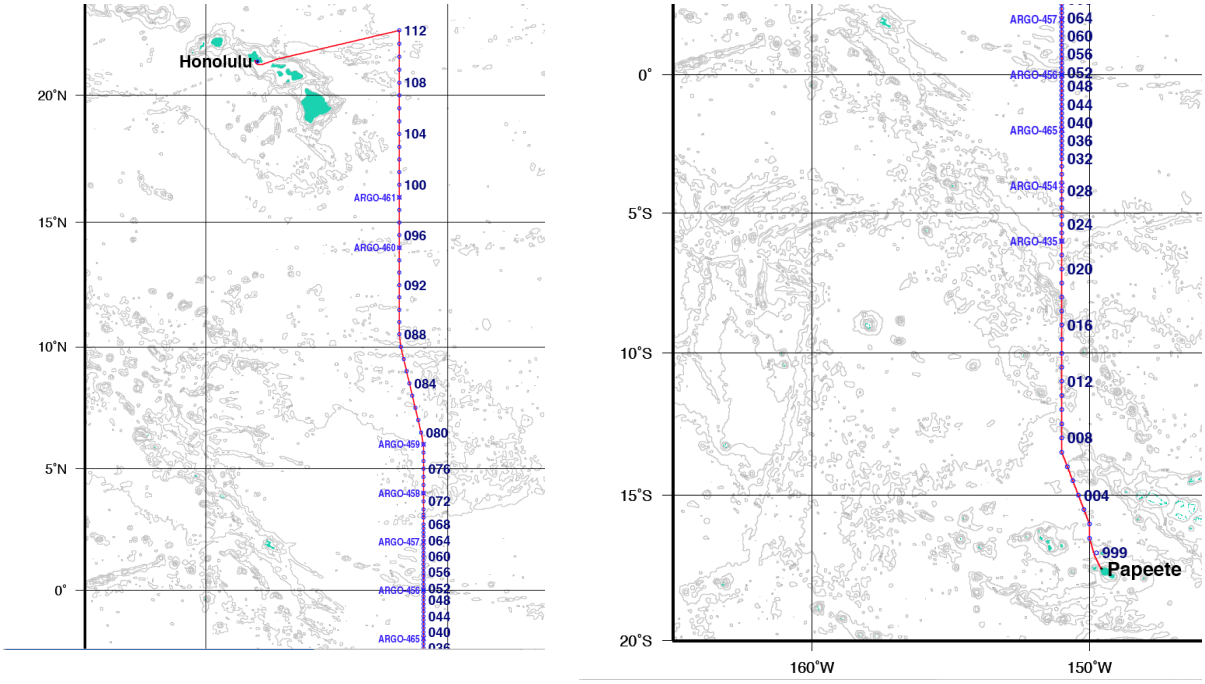
PRELIMINARY CRUISE REPORT: P16N Leg 1

(Updated AUG 2015)

Highlights



Cruise Summary Information

Section Designation	**P16N Leg 1**
Expedition designation (ExpoCodes)	**33RO20150410**
Chief Scientists	**Jessica Cross / NOAA/PMEL**
Co-Chief Scientist	**Samantha Siedlecki / JISAO**
Dates	2015 APR 10 - 2015 MAY 13
Ship	Ronald H Brown
Ports of call	Papeete, Tahiti – Honolulu, Hawaii
Geographic Boundaries	22° 30' 1" N 152° 0' 5" W 149° 59' 59" W 16° 30' 4" S
Stations	113
Floats and drifters deployed	9 Argo floats
Moorings deployed or recovered	0

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Links To Select Topics

Shaded sections are not relevant to this cruise or were not available when this report was compiled.

Cruise Summary Information	Hydrographic Measurements
Description of Scientific Program	**CTD Data:**
Geographic Boundaries	Acquisition
Cruise Track (Figure): PI CCHDO	Processing
Description of Stations	Calibration
Description of Parameters Sampled	Temperature Pressure
Bottle Depth Distributions (Figure)	Salinities Oxygens
Floats and Drifters Deployed	**Bottle Data**
Moorings Deployed or Recovered	Salinity
	Oxygen
Principal Investigators	Nutrients
Cruise Participants	Carbon System Parameters
	CFCs
Problems and Goals Not Achieved	Helium / Tritium
Other Incidents of Note	Radiocarbon
Underway Data Information	**References**
Navigation Bathymetry	
Acoustic Doppler Current Profiler (ADCP)	
Thermosalinograph	
XBT and/or XCTD	
Meteorological Observations	**Acknowledgments**
Atmospheric Chemistry Data	
Data Processing Notes	

GO-SHIP CLIVAR/Carbon P16N Leg 1

NOAAS Ronald H. Brown
10 April 2015 – 13 May 2015
Papeete, Tahiti – Honolulu, Hawaii

Chief Scientist:
Dr. Jessica Cross
National Oceanic and Atmospheric Administration, PMEL

Co-Chief Scientist:
Dr. Samantha Siedlecki
University of Washington, JISAO

Preliminary Cruise Report
13 May 2015

CTD Data Submitted by:

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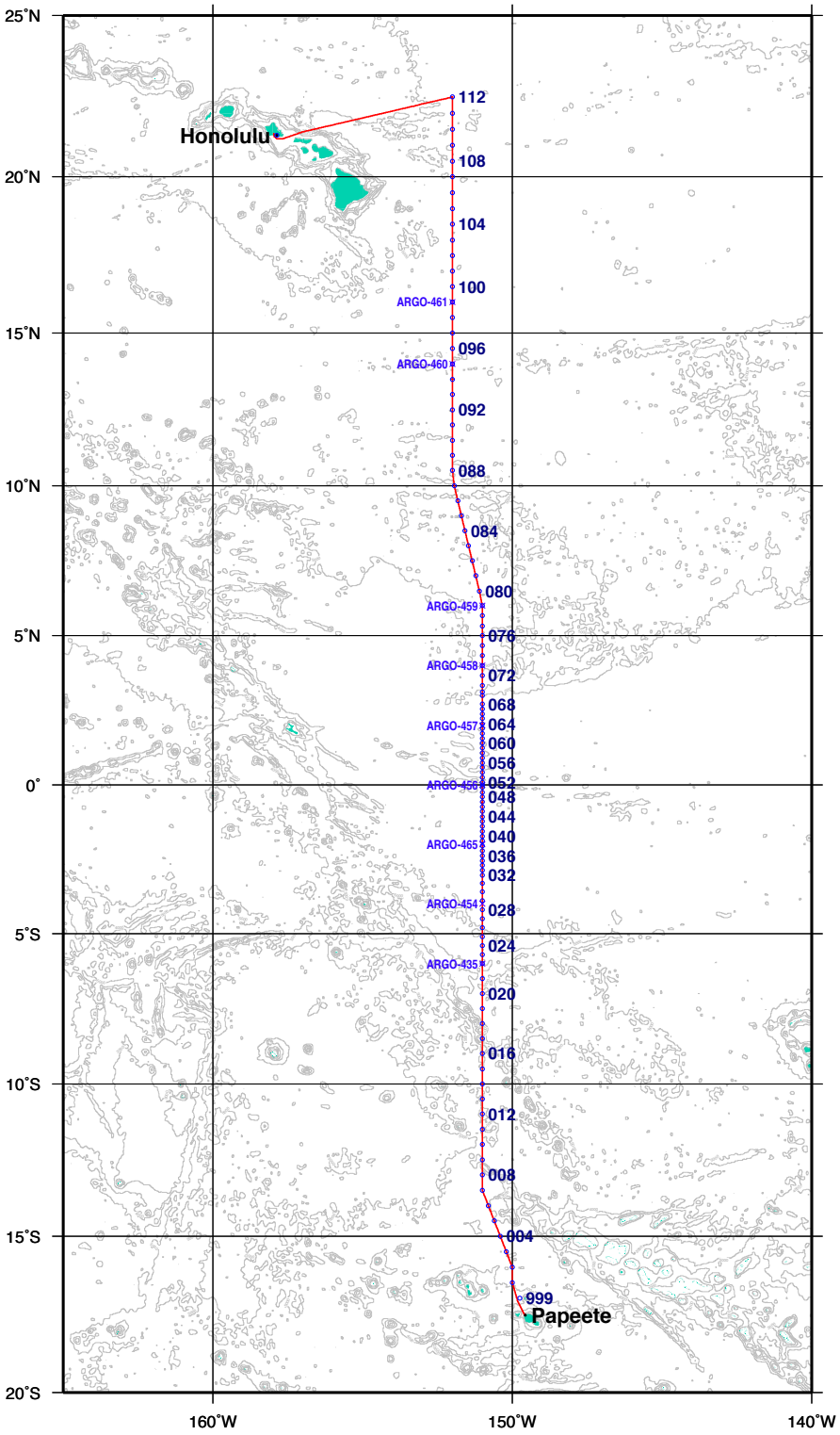
Preliminary Bottle Data Submitted by:

Mary Carol Johnson
Shipboard Technical Support/Oceanographic Data Facility
Scripps Institution of Oceanography/UC San Diego
La Jolla, CA

P16N Leg 1 Cruise Track



Introduction

Data from this cruise are available from CCHDO at:

http://cchdo.ucsd.edu/data_access/show_cruise?ExpoCode=33RO20150410

Acknowledgements

Background

More details on the program can be found at the website: http://ushydro.ucsd.edu. Specific information about this cruise can be found at:

http://www.aoml.noaa.gov/ocd/gcc/A16S_2014/

P16N Leg 1 Participating Institutions

Abbreviation	Institution
AOML	Atlantic Oceanographic and Meteorological Laboratory - NOAA
CCU	Coastal Carolina University
ERI	Earth Research Institute - UCSB
ESS	Dept. of Earth System Science - UCI
JISAO	Joint Institute for the Study of the Atmosphere and Ocean - UW
LDEO	Lamont-Doherty Earth Observatory - Columbia University
MPL	Marine Physical Laboratory - SIO
MSI	Marine Science Institute - UCSB
NOAA	National Oceanic and Atmospheric Administration
ODF	Oceanographic Data Facility (Shipboard Technical Support) - SIO
OSU	Oregon State University
PMEL	Pacific Marine Environmental Laboratory - NOAA
PU	Princeton University
RSMAS	Rosenstiel School of Marine and Atmospheric Science - UMiami
SBU	Stony Brook University
SIO	Scripps Institution of Oceanography - UCSD
UAF	University of Alaska, Fairbanks
UCI	University of California, Irvine
UCSB	University of California, Santa Barbara
UCSD	University of California, San Diego
UH	University of Hawaii
UMiami	University of Miami
URI	University of Rhode Island
USD	University of San Diego
UWash	University of Washington, Seattle
WHOI	Woods Hole Oceanographic Institution

Principal Programs of P16N Leg 1

Analysis	Institution	Principal Investigator	email
CTDO	NOAA/PMEL NOAA/AOML	Gregory Johnson Molly Baringer	Gregory.C.Johnson@noaa.gov Molly.Baringer@noaa.gov
Fluorometer / C-OPS	UCSB/ERI	Norm Nelson	norm@eri.ucsb.edu
Transmissometer	TAMU	Wilford Gardner	wgardner@ocean.tamu.edu
Underwater Vision Profiler (UVP)	UAF	Andrew McDonnell	amcdonnell@alaska.edu
Lowered ADCP	LDEO	Andreas Thurnherr	ant@ldeo.columbia.edu
Chipods	OSU	Jonathan Nash	nash@coas.oregonstate.edu
Data Management	SIO/ODF SIO/ODF	James Swift Susan Becker	jswift@ucsd.edu sbecker@ucsd.edu
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^{3}He / Neon / Tritium	WHOI	William Jenkins	wjenkins@whoi.edu
Dissolved O_2	RSMAS NOAA/AOML	Chris Langdon Molly Baringer	clangdon@rsmas.miami.edu Molly.Baringer@noaa.gov
Total CO_2 (DIC) / UW pCO_2	NOAA/PMEL NOAA/AOML	Simone Alin Rik Wanninkhof	Simone.R.Alin@noaa.gov Rik.Wanninkhof@noaa.gov
Total Alkalinity/pH	SIO/MPL	Andrew Dickson	adickson@ucsd.edu
^{13}C / ^{14}C-DIC	PU WHOI	Robert Key Ann McNichol	key@princeton.edu amcnichol@whoi.edu
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DO ^{14}C / Black Carbon	UCI/ESS	Ellen Druffel	edruffel@uci.edu
CDOM / POC / Chlorophyll a UW HPLC Pigments / AP	UCSB/ERI	Norm Nelson	norm@eri.ucsb.edu
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Salinity	NOAA/AOML NOAA/PMEL	Molly Baringer Gregory Johnson	Molly.Baringer@noaa.gov Gregory.C.Johnson@noaa.gov
^{137}Cs / ^{134}Cs / ^{90}Sr / ^{129}I	WHOI	Ken Buesseler	kbuesseler@whoi.edu
ARGO Floats	NOAA/PMEL	Gregory Johnson	Gregory.C.Johnson@noaa.gov
Shipboard ADCP	UH UH	Eric Firing Jules Hummon	efiring@hawaii.edu hummon@hawaii.edu

P16N Leg 1 Scientific Personnel

Duties	Name	Affiliation	email
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CTD Processing	Kristene McTaggart	PMEL	kristene.e.mctaggart@noaa.gov
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CTD / Salinity / LADCP / ET	James Hooper	AOML	james.hooper@noaa.gov
CTD Watchstander	Annie Foppert	URI	annie_foppert@my.uri.edu
CTD Watchstander	Alejandra Sanchez-Franks	SBU	alejandra.sanchezfranks@stonybrook.edu
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Nutrients	Eric Wisegarver	PMEL	eric.wisegarver@noaa.gov
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DIC / Underway pCO_2	Charles Featherstone	AOML	charles.featherstone@noaa.gov
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Alkalinity	Michael Fong	UCSD	mbfong@ucsd.edu
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^{3}He / Ne / Tritium, ^{14}C / ^{13}C	Zoe Sandwith	WHOI	zsandwith@whoi.edu
DOC / TDN	Anai Novoa	USD	anovoa@sandiego.edu
DO ^{14}C / Black Carbon	Sheila Griffin	UCI	sgriffin@uci.edu
CDOM	Norman Nelson	UCSB	norm@eri.ucsb.edu
CDOM	James Allen	UCSB	jgallen@eri.ucsb.edu
Chipod	Miguel Jiménez-Urias	UW	jimenezm@uw.edu
UVP	Andrew McDonnell	UAF	amcdonnell@alaska.edu

P16N Leg 1 Ship's Crew

Crew Member	**Position**	**Crew Member**	**Position**
CAPT Robert Kamphaus	Commanding Officer	CB Bruce Cowden	Chief Bosun
LCDR Nicole Manning	Executive Officer	BGL Reggie Williams	Bosun Group Leader
ENS Jesse Senzer	Navigation Officer	AB Vicky Carpenter	Able-Bodied Seaman
LT Adrienne Hopper	Operations Officer	AB William Sutton	Able-Bodied Seaman
ENS Dustin Picard	Safety Officer	AB Mike Lastinger	Able-Bodied Seaman
3M David Owen	Third Mate	AB Alex Couturier	Able-Bodied Seaman
		GVA Dana Reid	General Vessel Asst.
LCDR James McEntee	Medical Officer	GVA Linda Halderman	General Vessel Asst.
CME Frank Dunlop	Chief Engineer	CS Michael Smith	Chief Steward
1AE Mike Ryan	1st Asst. Engineer	CC Orcino Tan	Chief Cook
2AE Ray Zarzycki	2nd Asst. Engineer	2C Emir Porter	Second Cook
3AE Avery Edson	3rd Asst. Engineer	GVA Richard Jackson	General Vessel Asst.
JUE Mike Robinson	Jr. Unlicensed Engineer		
EU Mark Watson	Engine Utilityman		
		SST James Burkitt	Senior Survey Tech.
CET Clay Norfleet	Chief Electronics Tech.	ST Mark Bradley	Survey Tech.

Measurement Program Summary

NOAAS Ronald H. Brown departed Papeete, Tahiti mid-morning on 10 April 2015 and arrived at Pearl Harbor in Honolulu, Hawaii at 1500 HAST on 12 May 2015. A total of 113 stations were occupied during P16N Leg 1: 1 test station (999) to 1000 dbars; and 112 positions along the P16N line, each with one CTD/O_2/LADCP/rosette cast to within 8-12 meters of the bottom. A total of 9 Argo floats were deployed during the cruise. CTD PTSO$_2$, Altimeter, Transmissometer, CDOM Fluorometer, UVP, LADCP and Chipod electronic data, plus up to 24 water samples, were collected during each cast.

A 24-position, 11-liter Bullister bottle rosette frame (NOAA/AOML) was used to collect data. The distribution of the bottle samples during the cruise can be seen in Figures 1 and 2 below.

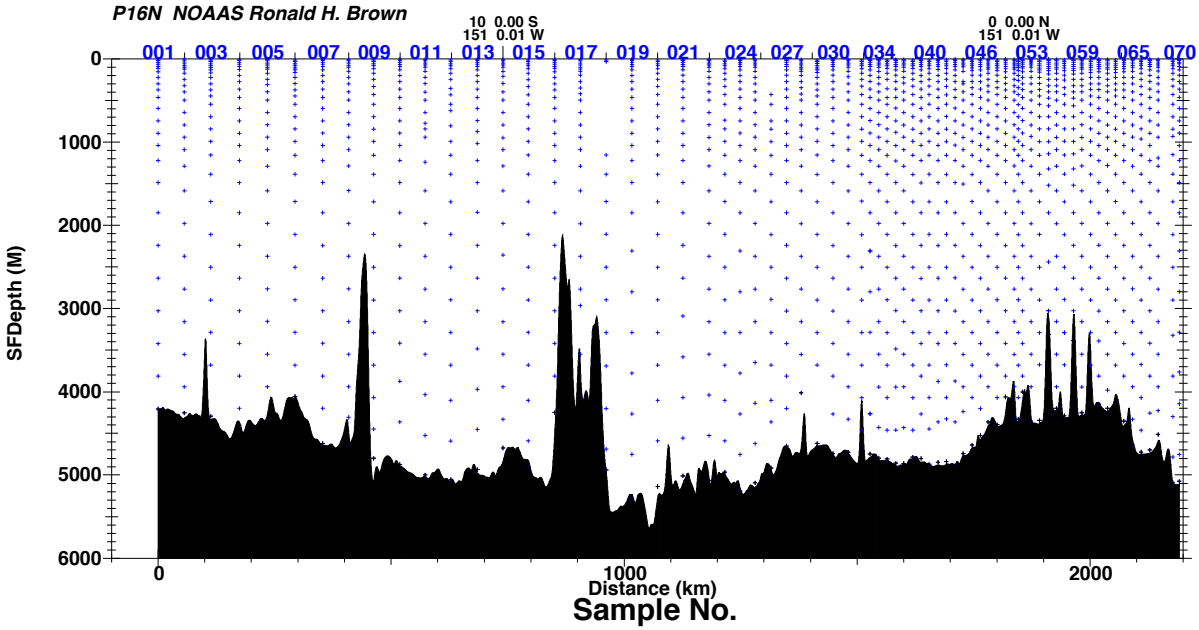

Figure 1 P16N Leg 1 Sample distribution, stations 1-70.

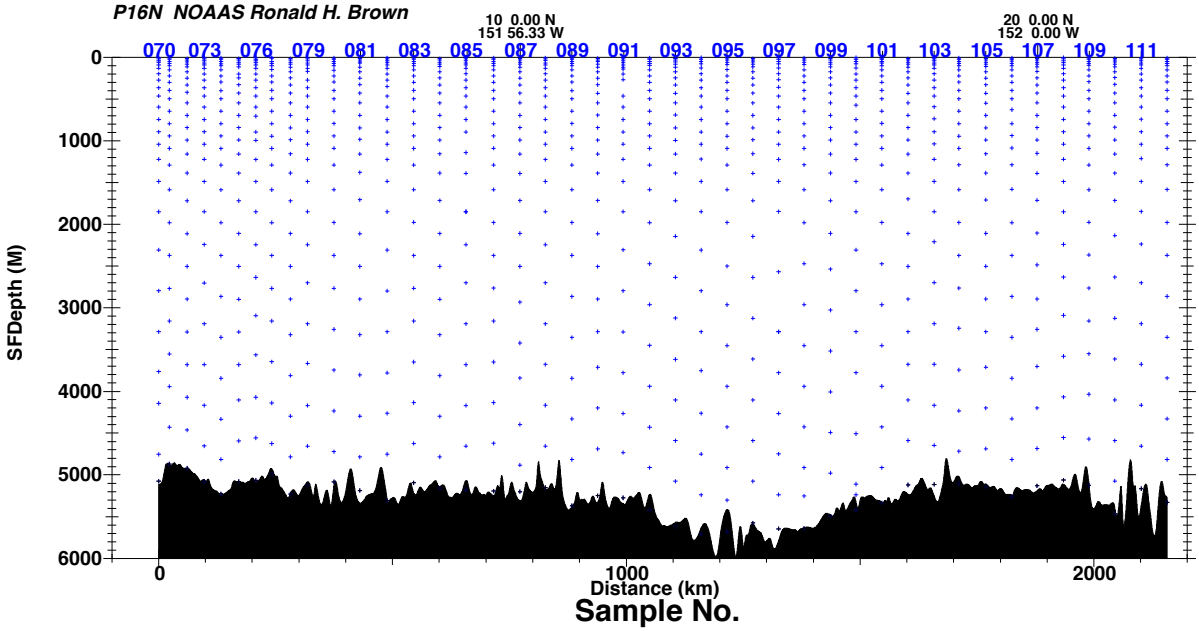

Figure 2 P16N Leg 1 Sample distribution, stations 70-112.

Ship's Underway Data Acquisition

Navigation data were acquired at 1-second intervals from the ship's Furuno GP150 P-Code GPS receiver by the SIO/ODF Linux system from the start of the cruise. In addition, centerbeam depth data, with a correction for hull depth included in each data line, were acquired directly from the ship's Seabeam/Kongsberg EM122 system. These data were used to connect the timestamps for each cruise deployment with position and ocean depth information.

The centerbeam depths were also continuously displayed, and data were manually recorded at cast start/bottom/end on CTD Cast Logs.

Etopo2 bathymetry data were merged with navigation time-series data after each cast and used for bottle-depth sections shown elsewhere in this report.

Various underway data were sent from the ship's computer systems to a serial feed on the Linux system. These data were stored at 1-second intervals:

Column	Data Type and units
1	Winch payout (uncorrected meters)
2	Winch speed (meters/minute)
3	Winch tension (pounds)
4	Multibeam Bottom Depth (meters to tenths) - corrected for Sound Velocity but not for hull depth (approx. 5.8m more)
5	UTC Julian Date (day of year in 2015)
6	UTC Time (hh:mm:ss) (hh=hours, mm=minutes, ss=seconds)
7	GPS Latitude (ddmm.mmmmH) (d=degrees, m=minutes to 4 places, H=Hemisphere)
8	GPS Longitude (dddmm.mmmmH)
9	TSG Sea Surface Temp (SST - degrees Celsius)
10	TSG Sea Surface Salinity (last calibrated 7-Jan-2015)
11	True Wind Speed (knots) - divide by 1.9438445 to get m/sec
12	True Wind Direction (compass degrees)
13	Barometer - Sea Level (millibars)
14	Relative Humidity (%)
15	Air Temperature (degrees Celsius)

Serial Feed Problems

There were numerous dropped bits in the serial feeds coming into the Linux system at the start of the cruise. Several large gaps in navigation data occurred for two nights in a row due to spikes in date or time. As a result, the RS232 Rocketport serial card was reseated and checked, then switched out for an older model Octaport that functioned much more reliably.

Missing navigation and bathymetry data gaps were filled in from ship's files. The first 5 days of messy Underway data were fixed manually over the course of the next week. The first 8 columns of Underway data have been more scrupulously checked; columns 9 through 15 may still have some errors until Julian Date 105 at 10:02 UTC.

Underwater Electronics Package

A Sea-Bird Electronics SBE9*plus* CTD was connected to a 24-place SBE32 carousel, providing for two-conductor sea cable operation. Two conducting wires in the 0.322 sea cable were soldered to their counterparts in the end termination: black for signal, and white for ground; the third (red) wire was cut back/unused. Power to the CTD and sensors, carousel and most instruments attached to the CTD was provided through the sea cable from an SBE11*plus* deck unit in the computer lab.

The CTD supplied a standard SBE-format data stream at a data rate of 24 Hz. The CTD provided pressure plus dual temperature, conductivity and dissolved oxygen channels. The CTD system also incorporated an altimeter, transmissometer, fluorometer, and Underwater Vision Profiler (UVP). A Lowered Acoustic Doppler Profiler (LADCP) and Chipods were also mounted on the rosette frame; both were powered separately and collected data internally.

The CTD system was outfitted with dual pumps. Primary temperature, conductivity and dissolved oxygen were plumbed into one pump circuit; and secondary temperature, conductivity and oxygen were plumbed into into the other. The CTD and sensors were deployed vertically. The primary temperature and conductivity sensors were used for reported CTD temperatures and salinities on all casts. The secondary temperature and conductivity sensors were used as calibration checks.

The fluorometer and transmissometer were removed from the package after cast 41/2. The UVP was powered independently of the CTD and recorded data internally during all casts, but also transmitted data through the CTD until it was detached after station 43. The transmissometer was added back before station 50.

Table 1 P16N Underwater Package Configuration

Manufacturer/Model	Serial No.	Calib.Date	Stations Used
Markey DESH-5 Winch	AFT	n/a	999, 1-41/1, 49/2-112
	FWD	n/a	41/2-49/1
Block Changed Out Prior to Station			19
Electrical and Mechanical Reterminations Before These Stations			19, 27, 41/2, 49/2, 67/1
Sea-Bird SBE11*plus* Deck Unit	11P9852-0367		999, 1-6, 8-40, 41/3-112
	11Pxxxx-1660		7, 41/1-41/2
Sea-Bird SBE32 Carousel Water Sampler (24-place)	PMEL 407	n/a	999, 1-41/3
	PMEL 53		41/4-50
	PMEL 163		51-53
	AOML 1032		54-112
Sea-Bird SBE35RT Reference Temperature	0076	28-Oct-2013	999, 1-41/3, 49/2-50
	0072	3-Jan-2012	61-112
Sea-Bird SBE9*plus* CTD Paroscientific Digiquartz Pressure	PMEL 0209 0209-53586	15-Jun-2011	999, 1-40
Sea-Bird SBE9*plus* CTD Paroscientific Digiquartz Pressure	PMEL 0315 0315-53960	13-Aug-2012	41/1-49/1
Sea-Bird SBE9*plus* CTD Paroscientific Digiquartz Pressure	RHB 0489 0489-67264	05-Sep-2014	49/2-112
Primary Sea-Bird Sensors:			
SBE3*plus* Temperature (T1)	03P-4341	20-Jan-2015	999, 1-112
SBE4C Conductivity (C1)	04-1180	05-Feb-2015	999, 1-94
	04-3157	21-Jan-2015	95-112
SBE43 Dissolved Oxygen	43-1835	03-Feb-2015	999, 1-49/1 (V6), 49/2-112 (V0)
SBE5 Pump	05-5855	n/a	999, 1-112
Secondary Sea-Bird Sensors:			
SBE3*plus* Temperature (T2)	03P-4569	20-Jan-2015	999, 1-69
	03P-4193	20-Jan-2015	70-112
SBE4C Conductivity Sensor (C2)	04-2887	13-Feb-2015	999, 1-3
	04-0354	20-Jan-2015	4-94
	04-3068	22-Jan-2015	95-112
SBE43 Dissolved Oxygen	43-0313	03-Feb-2015	999, 1-3 (V7)
	43-0312	05-Feb-2015	4-49/1 (V7), 49/2-112 (V2)
SBE5 Pump	05-0819	n/a	999, 1-5
	05-3481	n/a	6-112

Manufacturer/Model	Serial No.	Calib.Date	Stations Used
Other Devices Connected to CTD:			
Valeport VA500 Altimeter	47972	n/a	999, 1-49/1 (V0), 49/2-112 (V6)
HYDROPTIC UVP5 Underwater Vision Profiler	009	12-Sep-2013	999, 1-43 (V2) 999, 1-112 (internally recorded)
WETLabs CDOM Fluorometer	FLCDRTD-3117	13-May-2013	999, 1-41/2 (V4)
WETLabs C-Star Transmissometer	CST-1636DR	unknown	999, 1-41/2 (V5), 50-112 (V4)
RDI WHM150-1-UG15 LADCP			
150KHz Downlooker/Master	16283 19394		999, 1-40 41-95
600KHz Downlooker/Master	22696		96
300KHz Uplooker/Slave	13330		999, 1-96
300KHz Downlooker/Master	13330		97-112
600KHz Uplooker/Slave	22696		97-112

Chipod Serial Nos. (OSU-assembled - no Mfr)

Up/Down Looker	Logger Board	Pressure Case	Sensor	Sensor Holder	Stations Used
Up	2013	Ti44-7	14-26d	1	1-105
Up	2019	Ti44-6	14-26d	1	106-112
Up	2014	Ti44-8	14-24d	4	1-99
Up	2020	Ti44-5	14-28d	4	100-112
Down	2016	Ti44-1	14-25d	6	1-24,26-112
Down	2020	Ti44-5	14-25d	6	25
Down	2018	Ti44-3	11-25d	2	1-112

Water Sampling Package

The *NOAAS Ronald H. Brown* has two Markey DESH-5 winches. The AFT winch was used for most casts on P16N. The FWD winch was used for stations 41/2-49/1 in an attempt to identify the source of numerous modulo errors (non-sequential modulo/scan counts in the CTD data) and unsupported modem messages (from the carousel) during the casts. Reterminations of the winch wires are listed in Table 1 at the end of this section.

The AFT wire was lubricated with Strancore when it came from the manufacturer, and again during the up-cast of station 93. The lubrication was suspended for the last (surface) 100m of wire to avoid sample contamination.

All rosette casts were lowered to within 8-12 meters of the bottom, using the multibeam center depth value plus the altimeter on the rosette to determine distance. Three sampling schema were used in rotation to stagger standard sampling depths for consecutive stations. There were occasional exceptions made to the order of the schema or to capture a feature in the water column.

Four different SBE32 carousels were used during P16N in order to troubleshoot numerous "unsupported modem message" errors returning from the carousels. These came at random times, down-cast or up-cast, and almost always when the package came out of the water at the end of a cast. The errors coincided with carousel "resets" on several up-casts, causing multiple open bottles from "re-tripping" already-tripped positions. Only one carousel (PMEL 163) was replaced due to failing latches on bottles 9 and 22, which did not fire for 3 casts in a row.

The 24-place SBE32 carousels had occasional problems with releasing lanyards or mis-tripped bottles. Repairs or replacements and bottle height/lanyard adjustments were made as the cruise continued.

Rosette maintenance was performed on a regular basis. O-rings were changed and lanyards repaired as necessary. Bottle maintenance was performed each day to ensure proper closure and sealing. Valves were inspected for leaks and repaired or replaced as needed. Periodic leaks were noted on sample logs; several bottles were replaced early in

the cruise due to persistent leaks. These are documented in the quality comments section of the Appendix.

Bottle Sampling

At the end of each rosette deployment water samples were drawn from the bottles in the following order:

- Chlorofluorocarbons(CFCs) /N_2O /SF_6
- ^{3}Helium / Neon
- Dissolved O_2
- Dissolved Inorganic Carbon (DIC)
- Total pH
- Total Alkalinity (TAlk)
- ^{13}C / ^{14}C-DIC
- Dissolved Organic Carbon / Total Dissolved Nitrogen (DOC/TDN)
- DO ^{14}C
- POC
- Chlorophyll a
- Tritium
- Nutrients
- Salinity
- ^{137}Cs / ^{134}Cs / ^{90}Sr / ^{129}I
- Black Carbon

The correspondence between individual sample containers and the rosette bottle position (1-24) from which the sample was drawn was recorded on the sample log for the cast. This log also included any comments or anomalous conditions noted about the rosette and bottles. One member of the sampling team was designated the *sample cop*, whose sole responsibility was to maintain this log and insure that sampling progressed in the proper drawing order.

Normal sampling practice included opening the drain valve and then the air vent on the bottle, indicating an air leak if water escaped. This observation together with other diagnostic comments (e.g., "lanyard caught in endcap", "valve left open") that might later prove useful in determining sample integrity were routinely noted on the sample log. Drawing oxygen samples also involved taking the draw temperature from the bottle. The temperature was noted on the sample log and was sometimes useful in determining leaking or mis-tripped bottles.

Once individual samples had been drawn and properly prepared, they were distributed for analysis. On-board analyses were performed on computer-assisted analytical equipment networked to the data processing computer for centralized data management.

Bottle Data Processing

Water samples collected and properties analyzed shipboard were managed centrally in a relational database (PostgreSQL-8.1.23-10) run on a CentOS-5.11 Linux system. A web service (OpenACS-5.3.2-3 and AOLServer-4.5.1-1) front-end provided ship-wide access to CTD and water sample data. Web-based facilities included on-demand arbitrary property-property plots and vertical sections as well as data uploads and downloads.

Shipboard CTDO data were re-processed automatically at the end of each deployment using SIO/ODF CTD processing software v.5.1.6-1. The CTDO data and bottle trip files acquired by SBE SeaSave on the Windows 7 workstation were copied onto the Linux database and web server system. Pre-cruise calibration data were applied to CTD Pressure, Temperature and Conductivity sensor data, then the data were processed to a 0.5-second time series. A 1-decibar down-cast pressure series was created from the time series.

CTD up-cast data at bottle trips were extracted and added to the bottle database to use for CTD Pressure, Temperature and Salinity data in the preliminary bottle files. Pre-cruise calibration data were applied to these three parameters, in addition to PMEL preliminary shipboard conductivity corrections.

Time-series CTDO data from both down- and up-casts were matched along isopycnals to upcast trip data, then fit to bottle O_2 data using the SIO/ODF CTD processing software. The coefficients from these fits were applied, then CTD Oxygen data were extracted from the time-series up-cast data files and added to the database for quality control of bottle Dissolved O_2 data.

The NOAA/PMEL final PTSO data will replace the preliminary SIO/ODF CTD data in the bottle files after submission to CCHDO.

Cast Log and Sample Log information plus any diagnostic comments were entered into the database once sampling was completed. Quality flags associated with sampled properties were set to indicate that the property had been sampled, and sample container identifications were noted where applicable (e.g., oxygen flask number).

Analytical results were provided on a regular basis by the various analytical groups and incorporated into the database. These results included a quality code associated with each measured value and followed the coding scheme developed for the World Ocean Circulation Experiment (WOCE) Hydrographic Programme (WHP) [Joyc94].

Various consistency checks and detailed examination of the data continued throughout the cruise. Log notes were cross referenced with sample data values and quality coded. A summary of Cast Log and Sample Log comments, mis-trips, bottle lanyard issues and associated quality codes can be found in the Appendix.

APPENDIX

Bottle Data Quality Code Summary and Comments

This section contains WOCE quality codes [Joyc94] used during this cruise, and remarks regarding bottle data.

P16N Water Sample Quality Code Summary

Property	1	2	3	4	5	6	7	8	9	Total
Bottle	0	2635	21	4	0	0	0	0	9	2669
CFC-11	0	1519	9	11	28	0	0	0	0	1567
CFC-12	0	1526	6	7	28	0	0	0	0	1567
N_2O	0	1532	0	7	28	0	0	0	0	1567
SF_6	0	1524	5	10	28	0	0	0	0	1567
^{3}He	284	0	0	1	5	0	0	0	0	290
Neon	284	0	0	1	5	0	0	0	0	290
Dissolved O_2	0	2576	38	22	5	2	0	0	0	2643
DIC	0	1894	16	7	0	279	0	0	0	2196
pH	0	1604	29	4	1	558	0	0	0	2196
Total Alkalinity	0	1982	8	4	1	201	0	0	0	2196
^{13}C	439	0	0	0	0	0	0	0	0	439
^{14}C	439	0	0	0	0	0	0	0	0	439
DOC	1311	0	0	1	0	0	0	0	0	1312
TDN	1311	0	0	1	0	0	0	0	0	1312
DO ^{14}C	59	0	0	0	0	0	0	0	0	59
DO ^{14}C (Unfilt.)	2	0	0	0	0	0	0	0	0	2
POC	30	0	0	0	0	0	0	0	0	30
Chlorophyll a	0	209	3	2	4	0	0	0	0	218
Tritium	237	0	0	1	0	0	0	0	0	238
Nitrate	0	2211	0	4	9	428	0	0	1	2653
Nitrite	0	2211	0	4	9	428	0	0	1	2653
Phosphate	0	1990	0	264	9	389	0	0	1	2653
Silicic Acid	0	2216	0	4	9	423	0	0	1	2653
Salinity	0	2329	107	12	2	202	0	0	0	2652
^{134}Cs	58	0	0	0	0	0	0	0	0	58
^{137}Cs	58	0	0	0	0	0	0	0	0	58
^{129}I	58	0	0	0	0	0	0	0	0	58
^{90}Cs	58	0	0	0	0	0	0	0	0	58
Black Carbon	18	0	0	0	0	0	0	0	0	18

Quality evaluation of data included comparison of bottle salinity and bottle oxygen data with CTDO data using plots of differences; and review of various property plots and vertical sections of the station profiles and adjoining stations. Comments from the Sample Logs and the results of investigations into bottle problems and anomalous sample values are included in this report. Sample number in this table is the cast number times 100 plus the bottle position number.

P16N Bottle Quality Codes and Comments

Station /Cast	Sample Number	Property	Quality Code	Comment
1/1	102	Salinity	3	Deep Salinity is -0.003 vs CTDS. Code questionable.
1/1	104	O2	2	tiny bubbles in flask 30 after sampling.
1/1	107	O2	3	O2 value is 2 umol/kg low vs CTDO; o2 analyst: "tiny bubbles"
1/1	107	pH	3	BROKEN BOTTLE NECK
1/1	108	O2	3	O2 value is 1.5 umol/kg high vs CTDO; o2 analyst: "tiny bubbles"
1/1	110	Bottle	2	Nisk.10: out of water, no tritium, nuts or salt samples.
1/1	112	DIC	3	bad analysis
1/1	114	DIC	3	bad analysis
1/1	115	DIC	3	bad analysis
1/1	115	pH	3	BROKEN BOTTLE NECK
1/1	116	Bottle	3	Nisk.16a: leaked (second cast in a row); replaced O-ring.
1/1	117	DIC	3	bad analysis
1/1	118	Bottle	2	Nisk.18: slow flow for DIC, replaced petcock.
1/1	118	Refc.Temp.	3	SBE35RT reading is somewhat unstable, in a gradient. Code questionable.
1/1	121	Refc.Temp.	3	SBE35RT reading is somewhat unstable, in a gradient. Code questionable.
2/1	106	ph	2	pH broke sample bottle, re-sampled after TALK.
2/1	108	Salinity	3	Deep Salinity is -0.004 vs CTDS. Code questionable.
2/1	110	DIC	3	bad analysis
2/1	111	DIC	3	bad analysis
2/1	111	O2	2	O2 flask 115: re-sampled due to bubble.
2/1	112	O2	4	burette malfunction
2/1	116	Bottle	3	Nisk.16a: leak at bottom; DIC, pH, TALK not sampled. Niskin removed and checked.
2/1	116	Refc.Temp.	3	SBE35RT reading is very unstable, in a gradient. Code questionable.
2/1	117	Refc.Temp.	3	SBE35RT reading is unstable, in a gradient. Code questionable.
2/1	118	Bottle	4	Gas samples, nutrients and salinity indicate Nisk.18 mis-tripped: closed 100+db deeper than intended. Code samples bad.
2/1	118	DIC	4	Mis-tripped, code sample bad.
2/1	118	f11	4	Mis-tripped, code sample bad.
2/1	118	f12	4	Mis-tripped, code sample bad.
2/1	118	n2o	4	Mis-tripped, code sample bad.
2/1	118	Nitrite	4	Mis-tripped, code sample bad.
2/1	118	Nitrate	4	Mis-tripped, code sample bad.
2/1	118	O2	4	Mis-tripped, code sample bad.
2/1	118	ph	4	Mis-tripped, code sample bad.
2/1	118	Phosphate	4	Mis-tripped, code sample bad.
2/1	118	Salinity	4	Mis-tripped, code sample bad.
2/1	118	SF6	4	Mis-tripped, code sample bad.
2/1	118	Silicate	4	Mis-tripped, code sample bad.
2/1	118	TAlk	4	Mis-tripped, code sample bad.
2/1	119	DIC	3	bad analysis
2/1	119	Refc.Temp.	3	SBE35RT reading is very unstable, in a gradient. Code questionable.
2/1	120	DIC	3	bad analysis
2/1	120	O2	2	O2 flask 125: re-sampled due to bubble.
2/1	121	DIC	3	bad analysis
2/1	121	Refc.Temp.	3	SBE35RT reading is very unstable, in a gradient. Code questionable.
2/1	122	DIC	3	bad analysis
2/1	122	Salinity	2	Salinity is +0.05 vs CTDS. CTDS data stable at trip in gradient, but salinity matches values within 5db. Salinity is ok.
3/1	110	pH	3	BROKEN BOTTLE NECK

Station /Cast	Sample Number	Property	Quality Code	Comment
3/1	115	Bottle	2	DIC sampled before O2
3/1	116	Bottle	2	Nisk.16a replaced with smaller Niskin 16b (1L less volume) starting with this cast.
3/1	116	Refc.Temp.	3	SBE35RT reading is unstable, in a gradient. Code questionable.
3/1	117	Bottle	3	Nisk.17: leaking from bottom; DIC, pH, TALK not sampled.
3/1	120	Refc.Temp.	3	SBE35RT reading is somewhat unstable, in a gradient. Code questionable.
4/1	104	O2	5	Sample lost: no endpoint.
4/1	108	he	1	lost primary 3He sample, re-drew.
4/1	114	O2	5	Sample lost: no endpoint.
4/1	116	Bottle	3	Nisk.16b: leaking; only sampled nuts, salt.
4/1	116	Refc.Temp.	3	SBE35RT reading is unstable, in a gradient. Code questionable.
4/1	117	Bottle	2	Nisk.17: dripping from bottom O-ring, noticed after O2 sampled. DIC, pH, TALK not sampled.
4/1	117	Refc.Temp.	3	SBE35RT reading is somewhat unstable, in a gradient. Code questionable.
4/1	118	Bottle	2	Nisk.18: slow flow.
4/1	120	Refc.Temp.	3	SBE35RT reading is somewhat unstable, in a gradient. Code questionable.
4/1	121	Refc.Temp.	3	SBE35RT reading is unstable, in a gradient. Code questionable.
4/1	122	O2	4	1 cm bubble in sample
5/1	114	Refc.Temp.	3	SBE35RT reading is very unstable, in a gradient. Code questionable.
5/1	116	CTDT2	3	CTDT2 is -0.055 deg.C vs SBE35RT/CTDT1. Code questionable.
6/1	104	ph	2	pH broke sampling bottle, sample re-drawn after TALK.
6/1	113	ph	2	TALK drawn before pH.
6/1	118	Refc.Temp.	3	SBE35RT reading is somewhat unstable, in a gradient. Code questionable.
6/1	119	pH	3	BROKEN BOTTLE NECK
7/1	104	Bottle	2	Nisk.4: stopcock out, but not leaking.
7/1	111	Refc.Temp.	3	SBE35RT reading is somewhat unstable for a deeper region. Code questionable.
7/1	116	Refc.Temp.	3	SBE35RT reading is unstable, in a gradient. Code questionable.
7/1	118	Bottle	4	Gas samples and salinity indicate Nisk.18 mis-tripped: closed 100+db deeper than intended. Code samples bad.
7/1	118	chlor	4	Mis-tripped, code sample bad.
7/1	118	DIC	4	Mis-tripped, code sample bad.
7/1	118	doc	4	Mis-tripped, code sample bad.
7/1	118	f11	4	Mis-tripped, code sample bad.
7/1	118	f12	4	Mis-tripped, code sample bad.
7/1	118	n2o	4	Mis-tripped, code sample bad.
7/1	118	Nitrite	4	Nutrients appear to be a mis-draw from Nisk.19, code sample bad.
7/1	118	Nitrate	4	Nutrients appear to be a mis-draw from Nisk.19, code sample bad.
7/1	118	O2	4	O2 flask 122: re-sampled due to bubble. Mis-tripped, code sample bad.
7/1	118	ph	4	Mis-tripped, code sample bad.
7/1	118	Phosphate	4	Nutrients appear to be a mis-draw from Nisk.19, code sample bad.
7/1	118	Refc.Temp.	3	SBE35RT reading is very unstable, in a gradient. Code questionable.
7/1	118	Salinity	4	Mis-tripped, code sample bad.
7/1	118	SF6	4	Mis-tripped, code sample bad.
7/1	118	Silicate	4	Nutrients appear to be a mis-draw from Nisk.19, code sample bad.
7/1	118	TAlk	4	Mis-tripped, code sample bad.
7/1	118	tdn	4	Mis-tripped, code sample bad.
7/1	121	Bottle	2	Nisk.21-22: grease on spigots, cleaned off.
7/1	122	Bottle	2	Nisk.21-22: grease on spigots, cleaned off.
8/1	109	Salinity	3	Salinity is -0.004 vs CTDS. Code questionable.
8/1	113	O2	2	Draw T reading (2.8C) too low.

Station /Cast	Sample Number	Property	Quality Code	Comment
8/1	114	O2	2	Draw T reading too low: swapped out T probe after 1 failed sample, spare probe reading looks ok.
8/1	116	Refc.Temp.	3	SBE35RT reading is very unstable, in a gradient. Code questionable.
9/1	102	Bottle	2	Nisk.2 fired 10db shallower than intended depth.
9/1	118	O2	2	O2 T probe dropped between Nisk.17 and 18 samples; redo sample for 18 2x, T very high.
9/1	118	Refc.Temp.	3	SBE35RT reading is somewhat unstable, in a gradient. Code questionable.
9/1	119	O2	2	new O2 T probe starting with Nisk.19.
9/1	121	O2	2	forgot water seal on top of lid for flask 049 (replicate) after sampling.
10/1	116	Bottle	4	Gas samples, nutrients and salinity indicate Nisk.16 mis-tripped. Code samples bad.
10/1	116	DIC	4	Mis-tripped, code sample bad.
10/1	116	f11	4	Mis-tripped, code sample bad.
10/1	116	f12	4	Mis-tripped, code sample bad.
10/1	116	he	4	Mis-tripped, code sample bad.
10/1	116	n2o	4	Mis-tripped, code sample bad.
10/1	116	Nitrite	4	Mis-tripped, code sample bad.
10/1	116	Nitrate	4	Mis-tripped, code sample bad.
10/1	116	O2	4	Mis-tripped, code sample bad.
10/1	116	ph	4	Mis-tripped, code sample bad.
10/1	116	Phosphate	4	Mis-tripped, code sample bad.
10/1	116	Salinity	4	Mis-tripped, code sample bad.
10/1	116	SF6	4	Mis-tripped, code sample bad.
10/1	116	Silicate	4	Mis-tripped, code sample bad.
10/1	116	TAlk	4	Mis-tripped, code sample bad.
10/1	116	trit	4	Mis-tripped, code sample bad.
10/1	118	Bottle	2	long pause between O2 and DIC samples.
10/1	123	Bottle	2	long pause between O2 and DIC samples.
11/1	110	Bottle	2	Bottle depths changed slightly from scheme II to capture O2 features.
11/1	111	Bottle	2	Bottle depths changed slightly from scheme II to capture O2 features.
11/1	112	Bottle	2	Bottle depths changed slightly from scheme II to capture O2 features.
11/1	113	Bottle	2	Bottle depths changed slightly from scheme II to capture O2 features.
11/1	114	Bottle	2	Bottle depths changed slightly from scheme II to capture O2 features.
11/1	117	Refc.Temp.	3	SBE35RT reading is somewhat unstable, in a gradient. Code questionable.
11/1	120	CTDS1	4	upcast CTDS1 is -0.115 vs Salt and CTDS2: CTDS1 / CTDO2 indicate something likely blocked primary tubing at 100db stop. Use CTDS2 in database for this bottle only (CTDO2 ok, uses downcast).
11/1	120	O2	3	O2 value is 8.5 umol/kg high vs CTDO, near-surface max. Code questionable.
11/1	120	Refc.Temp.	3	SBE35RT reading is somewhat unstable, in a gradient. Code questionable.
11/1	121	O2	3	O2 value is 5 umol/kg high vs CTDO, in surface mixed layer. Code questionable.
12/1	103	Salinity	3	Deep Salinity is -0.003 vs CTDS. Code questionable.
12/1	113	Bottle	2	Bottle depths changed slightly from scheme III to capture O2 features.
12/1	114	Bottle	2	Bottle depths changed slightly from scheme III to capture O2 features.
12/1	117	Bottle	2	Bottle depths changed slightly from scheme III to capture O2 features.
12/1	119	Bottle	3	Nisk.19 leaky - spigot had water before valve opened: valve was never closed properly. Gases not sampled, only 13C/14C-DIC, nuts and salt.
12/1	119	Refc.Temp.	3	SBE35RT reading is very unstable, in a gradient. Code questionable.
13/1	103	Bottle	2	Nisk.3 clamp loose.
13/1	111	Bottle	2	Bottle depths changed slightly from scheme I to capture O2 features.
13/1	112	Bottle	2	Bottle depths changed slightly from scheme I to capture O2 features.

Station /Cast	Sample Number	Property	Quality Code	Comment
13/1	116	Refc.Temp.	3	SBE35RT reading is somewhat unstable, in a gradient. Code questionable.
13/1	117	Refc.Temp.	3	SBE35RT reading is somewhat unstable, in a gradient. Code questionable.
14/1	116	Bottle	4	Gas samples and nutrients indicate Nisk.16 mis-tripped deep. Salinity aligns at this level, but also with deeper values. Code samples bad.
14/1	116	DIC	4	Mis-tripped, code sample bad.
14/1	116	f11	4	Mis-tripped, code sample bad.
14/1	116	f12	4	Mis-tripped, code sample bad.
14/1	116	n2o	4	Mis-tripped, code sample bad.
14/1	116	Nitrite	4	Mis-tripped, code sample bad.
14/1	116	Nitrate	4	Mis-tripped, code sample bad.
14/1	116	O2	4	Mis-tripped, code sample bad.
14/1	116	ph	4	Mis-tripped, code sample bad.
14/1	116	Phosphate	4	Mis-tripped, code sample bad.
14/1	116	Salinity	4	Mis-tripped, code sample bad.
14/1	116	SF6	4	Mis-tripped, code sample bad.
14/1	116	Silicate	4	Mis-tripped, code sample bad.
14/1	116	TAlk	4	Mis-tripped, code sample bad.
14/1	118	Refc.Temp.	3	SBE35RT reading is unstable, in a gradient. Code questionable.
14/1	118	Salinity	2	Salinity is -0.065 vs CTDS. Bottle taken in a high gradient, salinity is ok.
14/1	119	Bottle	3	Nisk.19 leaking, gases not sampled, only nuts and salt.
15/1	101	Bottle	2	after sampling: cleaned spigots on Niskins with a phosphate-free soap, followed by a mild HCl solution (to remove any residual stopper grease).
15/1	102	Bottle	2	after sampling: cleaned spigots on Niskins with a phosphate-free soap, followed by a mild HCl solution (to remove any residual stopper grease).
15/1	103	Bottle	2	after sampling: cleaned spigots on Niskins with a phosphate-free soap, followed by a mild HCl solution (to remove any residual stopper grease).
15/1	104	Bottle	2	after sampling: cleaned spigots on Niskins with a phosphate-free soap, followed by a mild HCl solution (to remove any residual stopper grease).
15/1	105	Bottle	2	after sampling: cleaned spigots on Niskins with a phosphate-free soap, followed by a mild HCl solution (to remove any residual stopper grease).
15/1	106	Bottle	2	after sampling: cleaned spigots on Niskins with a phosphate-free soap, followed by a mild HCl solution (to remove any residual stopper grease).
15/1	107	Bottle	2	after sampling: cleaned spigots on Niskins with a phosphate-free soap, followed by a mild HCl solution (to remove any residual stopper grease).
15/1	108	Bottle	2	after sampling: cleaned spigots on Niskins with a phosphate-free soap, followed by a mild HCl solution (to remove any residual stopper grease).
15/1	109	Bottle	2	after sampling: cleaned spigots on Niskins with a phosphate-free soap, followed by a mild HCl solution (to remove any residual stopper grease).
15/1	110	Bottle	2	after sampling: cleaned spigots on Niskins with a phosphate-free soap, followed by a mild HCl solution (to remove any residual stopper grease).
15/1	111	Bottle	2	after sampling: cleaned spigots on Niskins with a phosphate-free soap, followed by a mild HCl solution (to remove any residual stopper grease).
15/1	112	Bottle	2	after sampling: cleaned spigots on Niskins with a phosphate-free soap, followed by a mild HCl solution (to remove any residual stopper grease).
15/1	113	Bottle	2	after sampling: cleaned spigots on Niskins with a phosphate-free soap, followed by a mild HCl solution (to remove any residual stopper grease).
15/1	114	Bottle	2	after sampling: cleaned spigots on Niskins with a phosphate-free soap, followed by a mild HCl solution (to remove any residual stopper grease).
15/1	115	Bottle	2	after sampling: cleaned spigots on Niskins with a phosphate-free soap, followed by a mild HCl solution (to remove any residual stopper grease).

Station /Cast	Sample Number	Property	Quality Code	Comment
15/1	116	Bottle	2	after sampling: cleaned spigots on Niskins with a phosphate-free soap, followed by a mild HCl solution (to remove any residual stopper grease).
15/1	117	Bottle	2	after sampling: cleaned spigots on Niskins with a phosphate-free soap, followed by a mild HCl solution (to remove any residual stopper grease).
15/1	117	Refc.Temp.	3	SBE35RT reading is unstable, in a gradient. Code questionable.
15/1	118	Bottle	2	after sampling: cleaned spigots on Niskins with a phosphate-free soap, followed by a mild HCl solution (to remove any residual stopper grease).
15/1	118	Refc.Temp.	3	SBE35RT reading is very unstable, in a gradient. Code questionable.
15/1	119	Bottle	2	after sampling: cleaned spigots on Niskins with a phosphate-free soap, followed by a mild HCl solution (to remove any residual stopper grease).
15/1	120	Bottle	2	after sampling: cleaned spigots on Niskins with a phosphate-free soap, followed by a mild HCl solution (to remove any residual stopper grease).
15/1	121	Bottle	2	after sampling: cleaned spigots on Niskins with a phosphate-free soap, followed by a mild HCl solution (to remove any residual stopper grease).
15/1	122	Bottle	2	after sampling: cleaned spigots on Niskins with a phosphate-free soap, followed by a mild HCl solution (to remove any residual stopper grease).
15/1	123	Bottle	2	after sampling: cleaned spigots on Niskins with a phosphate-free soap, followed by a mild HCl solution (to remove any residual stopper grease).
15/1	124	Bottle	2	after sampling: cleaned spigots on Niskins with a phosphate-free soap, followed by a mild HCl solution (to remove any residual stopper grease).
16/1	101	Bottle	2	smaller Nisk.16b placed in carousel position 1 for this cast only.
16/1	114	Bottle	2	Nisk.14 ran out of water mid-POC draw; no tritium, nuts, salt samples.
16/1	116	Bottle	2	Nisk.1a moved to carousel position 16 starting with this cast; long delay between CFC and 3He draw.
16/1	117	Refc.Temp.	3	SBE35RT reading is very unstable, in a gradient. Code questionable.
16/1	118	Refc.Temp.	3	SBE35RT reading is somewhat unstable, in a gradient. Code questionable.
16/1	124	Bottle	2	Nisk.24 ran dry during tritium sampling; no nuts, salt samples.
17/1	101	Bottle	2	small Nisk.16b replaced with (new) PMEL Nisk.1b in carousel posn. 1.
17/1	101	O2	4	1cm bubble
17/1	117	Refc.Temp.	3	SBE35RT reading is very unstable, in a gradient. Code questionable.
17/1	118	Bottle	2	Nisk.18 raised upward on rosette prior to cast.
17/1	119	O2	3	O2 value is 8.5 umol/kg high vs CTDO (no analytical notes)
17/1	119	Refc.Temp.	3	SBE35RT reading is somewhat unstable, in a gradient. Code questionable.
17/1	120	Salinity	2	Salinity is +0.075 vs CTDS. Bottle taken in a high gradient, salinity is ok.
18/1	101	Bottle	2	small Nisk.16b replaced with Nisk.1b in carousel posn. 1.
18/1	112	Bottle	2	bottle closed near surface (33dbar) due to carousel re-initializing after Nisk.11 fired.
18/1	113	Bottle	2	bottle closed near surface (15dbar) due to carousel re-initializing after Nisk.11 fired.
18/1	113	TAlk	3	Value appears high. Value confirmed with rerun.
19/1	101	Bottle	3	Nisk.1b has a slow drip from spigot unless pulled out hard.
19/1	122	Salinity	4	Salinity is +0.155 vs CTDS, salt sample appears to be mis-drawn from Nisk.21, code bad.
20/1	115	Refc.Temp.	3	SBE35RT reading is unstable, in a low-gradient area. Code questionable.
20/1	117	TAlk	2	"When compared to 2015 P16N Station 19 and 21, value appears high. When compared to 2006 P16N of the same Lat, value appears fine. "
20/1	118	TAlk	2	"When compared to 2015 P16N Station 19 and 21, value appears fine. When compared to 2006 P16N of the same Lat, value appears low. "
20/1	120	Refc.Temp.	3	SBE35RT reading is somewhat unstable, in a gradient. Code questionable.
21/1	106	TAlk	3	Measured value might be a few units high
21/1	110	DIC	3	20 min RT, questionable analysis

Station /Cast	Sample Number	Property	Quality Code	Comment
21/1	114	Refc.Temp.	3	SBE35RT reading is unstable, in a gradient. Code questionable.
21/1	116	Refc.Temp.	3	SBE35RT reading is somewhat unstable, in a gradient. Code questionable.
22/1	101	Salinity	3	Bottom Salinity is +0.01 vs CTDS. Code questionable.
22/1	110	Refc.Temp.	3	SBE35RT reading is somewhat unstable for a deeper region. Code questionable.
22/1	115	f11	2	CFC syringe 379 changed out for 262 and re-sampled.
22/1	115	f12	2	CFC syringe 379 changed out for 262 and re-sampled.
22/1	115	n2o	2	CFC syringe 379 changed out for 262 and re-sampled.
22/1	115	SF6	2	CFC syringe 379 changed out for 262 and re-sampled.
22/1	118	O2	2	O2 is 39.5 umol/kg low vs downcast CTDO, in a high gradient. OK vs upcast, code acceptable.
23/1	114	Bottle	2	changed depth from scheme (700 to 745db) to capture a deeper O2 min.
23/1	120	Salinity	2	Salinity is +0.055 vs CTDS. Bottle taken in a high gradient, salinity is ok.
23/1	121	Salinity	2	Salinity is +0.05 vs CTDS. Bottle taken in a high gradient, salinity is ok.
24/1	107	Bottle	3	Nisk.7 leaking slightly.
24/1	115	Refc.Temp.	3	SBE35RT reading is somewhat unstable, in a gradient. Code questionable.
24/1	118	Salinity	2	Salinity is +0.075 vs CTDS. Bottle taken in a high gradient, salinity is ok.
24/1	124	Refc.Temp.	3	SBE35RT reading is somewhat unstable, in a gradient. Code questionable.
25/1	118	Refc.Temp.	3	SBE35RT reading is very unstable, in a gradient. Code questionable.
25/1	120	Refc.Temp.	3	SBE35RT reading is somewhat unstable, in a gradient. Code questionable.
26/1	101	Salinity	3	Deep Salinity is +0.003 vs CTDS. Code questionable.
26/1	114	Bottle	2	target depth changed to catch O2 feature.
26/1	115	f11	2	CFC syringe 588 changed out for 303 and re-sampled.
26/1	115	f12	2	CFC syringe 588 changed out for 303 and re-sampled.
26/1	115	n2o	2	CFC syringe 588 changed out for 303 and re-sampled.
26/1	115	SF6	2	CFC syringe 588 changed out for 303 and re-sampled.
26/1	116	Bottle	9	Nisk.16 did not fire/close: modulo errors during upcast, brought back to surface without tripping any more bottles.
27/1	101	Salinity	2	Salt Sample bottle 1401 has chipped rim.
27/1	102	O2	4	bad endpoint best fit line
27/1	106	Bottle	2	grease on spigots again; Nisk.6 dirty.
27/1	118	Refc.Temp.	3	SBE35RT reading is very unstable, in a gradient. Code questionable.
27/1	119	Bottle	3	Nisk.19 leaked: valve was open. No gases sampled.
27/1	119	Refc.Temp.	3	SBE35RT reading is unstable, in a gradient. Code questionable.
28/1	102	Refc.Temp.	3	Deep SBE35RT reading is unstable. Code questionable.
28/1	105	Bottle	3	Slight leak from bottom cap; inspected after cast.
28/1	115	O2	2	O2 is 30.5 umol/kg low vs downcast CTDO, in a high gradient. OK vs upcast, code acceptable.
28/1	119	Bottle	2	Replaced vent cap for Nisk.19 before this cast.
28/1	119	Refc.Temp.	3	SBE35RT reading is somewhat unstable, in a gradient. Code questionable.
29/1	113	O2	2	O2 is 21.5 umol/kg low vs downcast CTDO, in a high gradient. OK vs upcast, code acceptable.
29/1	114	O2	2	O2 is 23 umol/kg low vs downcast CTDO, in a high gradient. OK vs upcast, code acceptable.
29/1	116	O2	2	O2 is 31 umol/kg low vs downcast CTDO, in a high gradient. OK vs upcast, code acceptable.
29/1	118	O2	2	Uncertain T reading for O2: 26.0 or 20.6?
29/1	118	Refc.Temp.	3	SBE35RT reading is very unstable, in a gradient. Code questionable.
30/1	101	Bottle	2	Nisk.1b spigot is dripping despite being pulled all the way out.
30/1	110	Salinity	3	Deeper Salinity is +0.005 vs CTDS. Code questionable.
30/1	113	O2	2	O2 is 10.5 umol/kg low vs downcast CTDO, in a high gradient. OK vs upcast, code acceptable.

Station /Cast	Sample Number	Property	Quality Code	Comment
30/1	114	O2	2	O2 is 30 umol/kg low vs downcast CTDO, in a high gradient. OK vs upcast, code acceptable.
30/1	115	DIC	6	Looks like outlier, but nutrients, pH, and to some extent O2 follow
30/1	115	O2	2	very low O2 on CTD profile.
30/1	116	O2	2	very low O2 on CTD profile.
30/1	117	O2	2	very low O2 on CTD profile.
31/1	104	Salinity	3	Deep Salinity is +0.01 vs CTDS. Code questionable.
31/1	106	Salinity	3	Deep Salinity is +0.01 vs CTDS. Code questionable.
31/1	118	Refc.Temp.	3	SBE35RT reading is unstable, in a gradient. Code questionable.
31/1	119	O2	2	O2 value is 30.5/15.0 umol/kg low vs downcast/upcast CTDO, but in a very high gradient. Code acceptable.
31/1	119	Refc.Temp.	3	SBE35RT reading is very unstable, in a gradient. Code questionable.
31/1	119	Salinity	2	Salinity is -0.11 vs CTDS. Bottle taken in a high gradient, salinity ok.
31/1	121	Refc.Temp.	3	SBE35RT reading is somewhat unstable/in a gradient. Code questionable.
31/1	124	Bottle	2	Started sampling with Nisk.24, then 1-23, since some analysts only took surface samples.
31/1	124	O2	4	O2 value is 5 umol/kg high vs CTDO (mixed layer). O2 analyst: "bad fit"
32/1	105	Salinity	3	Deep Salinity is +0.01 vs CTDS. Code questionable.
32/1	108	Salinity	3	Deeper Salinity is -0.007 vs CTDS. Code questionable.
32/1	119	Refc.Temp.	3	SBE35RT reading is unstable, in a gradient. Code questionable.
33/1	102	Bottle	2	Nisk.2+3 fired at same depth to test wait time for CFCs. Only CFCs sampled on 103.
33/1	103	Bottle	2	Nisk.2+3 fired at same depth to test wait time for CFCs. Only CFCs sampled on 103.
33/1	104	Bottle	2	Nisk.4 re-fired out-of-order at same depth as Nisk.7 to verify whether it closed before or after acqsn. re-start. (.bl file says it closed after re-start.)
33/1	119	Refc.Temp.	3	SBE35RT reading is very unstable, in a gradient. Code questionable.
33/1	124	Bottle	2	Started sampling with Nisk.24, then 1-23, to allow for Sheila's ultra-filtration sample.
34/1	101	Salinity	3	Deep Salinity +0.005 vs CTDS. Code questionable.
34/1	106	O2	2	O2 flask 7 cracked? Leaking DI water from around the lip.
34/1	111	Refc.Temp.	3	SBE35RT reading is somewhat unstable for a deeper region. Code questionable.
34/1	118	Refc.Temp.	3	SBE35RT reading is somewhat unstable, in a gradient. Code questionable.
34/1	119	Bottle	3	Nisk.19 leaked, valve closed.
34/1	119	Refc.Temp.	3	SBE35RT reading is extremely unstable, in a gradient. Code questionable.
35/1	101	Bottle	3	Nisk.1 leaks? from spigot
35/1	106	Salinity	3	Deep Salinity is -0.004 vs CTDS. Code questionable.
35/1	112	Refc.Temp.	3	SBE35RT reading is somewhat unstable for a deeper region. Code questionable.
35/1	116	Bottle	2	Nisk.16 trip level 37db deeper than scheme to capture O2 min.
35/1	117	Bottle	2	Nisk.17 trip level 26db deeper than scheme to capture O2 min.
36/1	103	Bottle	2	Missed target depth, triggered shallower by 30m.
36/1	104	Bottle	2	Nisk.4 stopper broke before salts sampled, but got samples anyways.
36/1	118	Refc.Temp.	3	SBE35RT reading is very unstable, in a gradient. Code questionable.
36/1	119	Bottle	3	Nisk.19 leaked from spigot, only sampled by nuts, salt.
36/1	119	Refc.Temp.	3	SBE35RT reading is very unstable, in a gradient. Code questionable.
37/1	107	Salinity	3	Deep Salinity is +0.008 vs CTDS. Code questionable.
37/1	110	CTDS1	3	CTDS1 is -0.04 vs Salinity/CTDS2; spike in CTD signal at bottle 10. Code questionable.
37/1	119	Bottle	2	Nisk.19 is not leaking this time.
38/1	116	O2	2	O2 is 23.5 umol/kg low vs downcast CTDO, in a gradient feature. OK vs upcast, code acceptable.

Station /Cast	Sample Number	Property	Quality Code	Comment
38/1	119	Refc.Temp.	3	SBE35RT reading is very unstable, in a gradient. Code questionable.
38/1	120	Refc.Temp.	3	SBE35RT reading is unstable, in a gradient. Code questionable.
38/1	122	Refc.Temp.	3	SBE35RT reading is unstable, in a gradient. Code questionable.
39/1	115	Bottle	2	Nisk.15 pressure-release valve gone upon recovery, put a new one in.
39/1	118	Bottle	2	Nisk.18 spigot has red/orange particles on it.
39/1	118	Refc.Temp.	3	SBE35RT reading is unstable, in a gradient. Code questionable.
39/1	119	Bottle	2	Nisk.19a replaced with new Nisk.19b before cast, due to cumulative leaking history. All valves open EXCEPT Nisk.19b.
40/1	101	Salinity	3	Deep Salinity is +0.02 vs CTDS. Code questionable.
40/1	102	Salinity	3	Deep Salinity is +0.008 vs CTDS. Code questionable.
40/1	104	Salinity	3	Deep Salinity is +0.004 vs CTDS. Code questionable.
40/1	109	Salinity	3	Deeper Salinity is +0.005 vs CTDS. Code questionable.
40/1	119	Refc.Temp.	3	SBE35RT reading is very unstable, in a gradient. Code questionable.
41/4	408	Salinity	3	Deep Salinity is -0.004 vs CTDS. Code questionable.
41/4	410	Bottle	9	Nisk.10 lanyard got caught by safety line during recovery, dumped out water. No samples.
41/4	424	Bottle	2	Surface depth shifted 5m deeper than scheme because it rained.
42/1	106	Salinity	3	Deep Salinity is +0.007 vs CTDS. Code questionable.
43/1	122	Salinity	3	Salinity is +0.05 vs CTDS, in mixed layer. Code questionable.
44/1	101	Salinity	3	Deep Salinity is -0.005 vs CTDS, code questionable.
44/1	107	Salinity	3	Deeper Salinity is +0.005 vs CTDS, code questionable.
44/1	108	Salinity	3	Deeper Salinity is +0.004 vs CTDS, code questionable.
44/1	119	Bottle	2	Nisk.19 cocked without lanyard in squib.
45/1	103	Bottle	2	CFCs doing a test on Nisk.3 (but no samples logged).
46/1	108	Salinity	3	Deeper Salinity is -0.008 vs CTDS. Code questionable.
47/1	103	Bottle	2	DW drew clean water out of Nisk.3
47/1	109	Bottle	2	Jellies tangled in Nisk.9, likely closed on a tentacle.
48/1	101	O2	3	O2 value is 4 umol/kg high vs CTDO (no analytical notes).
48/1	101	Salinity	3	Deep Salinity is +0.035 vs CTDS, no issues noted with other samples. Code questionable.
48/1	108	Salinity	3	Deeper Salinity is +0.01 vs CTDS, no issues noted with other samples. Code questionable.
48/1	109	Salinity	3	Deeper Salinity is +0.01 vs CTDS, no issues noted with other samples. Code questionable.
48/1	110	Salinity	3	Deeper Salinity is +0.01 vs CTDS, no issues noted with other samples. Code questionable.
48/1	111	Salinity	3	Deeper Salinity is -0.0045 vs CTDS, no issues noted with other samples. Code questionable.
48/1	119	Bottle	3	Nisk.19b leaking from bottom endcap: lanyard from Nisk.18 stuck in it. Only nuts sampled it (from the endcap).
49/2	208	Refc.Temp.	3	SBE35RT reading is unstable for a deeper region. Code questionable.
49/2	208	Salinity	3	Deeper Salinity +0.005 vs CTDS. Code questionable.
50/1	102	O2	2	after Flask 2/Nisk.2 sampled, O2 thermistor dropped on ground.
50/1	103	O2	3	O2 Flask 3 lid was not closed tight after sampling - "floating". O2 value is 2 umol/kg high vs CTDO. Code questionable.
50/1	108	Bottle	2	Nisk.8 spigot had grease on it.
50/1	109	Salinity	3	Deeper Salinity +0.005 vs CTDS. Code questionable.
50/1	111	Refc.Temp.	3	SBE35RT reading is very unstable for a deeper region. Code questionable.
50/1	118	Refc.Temp.	3	SBE35RT reading is very unstable, in a gradient. Code questionable.
50/1	121	Bottle	2	NO-confirm from carousel for Nisk.21, but it was closed upon recovery.
51/1	101	O2	3	O2 value is 5 umol/kg high vs CTDO, no analytical notes. Code questionable.

Station /Cast	Sample Number	Property	Quality Code	Comment
51/1	109	Bottle	9	Nisk.9 did not close
51/1	117	Bottle	2	O2 sampled before He.
51/1	122	Bottle	9	Nisk.22 did not close
51/1	123	O2	4	spilled part of sample
52/1	105	Salinity	3	Deeper Salinity is +0.0035 vs CTDS. Code questionable.
52/1	109	Bottle	9	Nisk.9 did not close again.
52/1	110	Salinity	3	Deeper Salinity is +0.005 vs CTDS. Code questionable.
52/1	117	O2	4	spilled a little before titrating
52/1	122	Bottle	9	Nisk.22 did not close again.
53/1	109	Bottle	9	Nisk.9 did not close again.
53/1	122	Bottle	9	Nisk.22 did not close again.
54/1	102	O2	4	pushed reset for titrated
54/1	110	Salinity	4	Salinity is +0.015 vs CTDS; matches Salinity from Nisk.9. Mis-draw, code bad.
54/1	116	O2	2	O2 is 32 umol/kg low vs downcast CTDO, near minimum. OK vs upcast, code acceptable.
54/1	119	Salinity	2	Salinity is +0.055/+0.05 vs CTDS1/CTDS2. Bottle taken in a high gradient, salinity is ok.
55/1	101	O2	3	O2 value is 2-3 umol/kg high vs CTDO. Re-sampled O2 with recalibrated thermometer after Nisk. had been open for a while.
55/1	103	Bottle	2	Nisk.3 dup. depth for CFCs incubation test.
55/1	103	O2	3	O2 value is 2-3 umol/kg high vs CTDO. Re-sampled O2 with recalibrated thermometer after Nisk. had been open for a while.
55/1	104	O2	3	O2 value is 2-3 umol/kg high vs CTDO. Re-sampled O2 with recalibrated thermometer after Nisk. had been open for a while.
55/1	105	O2	3	O2 value is 2-3 umol/kg high vs CTDO. Re-sampled O2 with recalibrated thermometer after Nisk. had been open for a while.
55/1	106	O2	2	O2 value is ok vs CTDO. O2 thermometers failed during Nisk.6 sampling. Re-sampled O2 with recalibrated thermometer.
55/1	108	Salinity	3	Deeper Salinity is +0.005 vs CTD. Code questionable.
55/1	109	Salinity	3	Deeper Salinity is +0.01 vs CTDS. Code questionable.
55/1	118	O2	3	O2 value is 15.5 umol/kg low vs CTDO or nearby casts, in mid-thermocline feature. Code questionable.
56/1	101	O2	3	O2 value is 3 umol/kg high vs CTDO (no analytical notes).
56/1	110	O2	3	O2 value is 4 umol/kg low vs CTDO (no analytical notes).
56/1	111	O2	3	O2 value is 3 umol/kg low vs CTDO (no analytical notes).
56/1	113	O2	3	O2 value is 12 umol/kg low vs CTDO (no analytical notes).
57/1	101	Nitrite	5	Water dumped from Niskin prior to nutrient sampling.
57/1	101	Nitrate	5	Water dumped from Niskin prior to nutrient sampling.
57/1	101	Phosphate	5	Water dumped from Niskin prior to nutrient sampling.
57/1	101	Silicate	5	Water dumped from Niskin prior to nutrient sampling.
57/1	102	Nitrite	5	Water dumped from Niskin prior to nutrient sampling.
57/1	102	Nitrate	5	Water dumped from Niskin prior to nutrient sampling.
57/1	102	O2	4	off precipitate color
57/1	102	Phosphate	5	Water dumped from Niskin prior to nutrient sampling.
57/1	102	Silicate	5	Water dumped from Niskin prior to nutrient sampling.
57/1	103	Nitrite	5	Water dumped from Niskin prior to nutrient sampling.
57/1	103	Nitrate	5	Water dumped from Niskin prior to nutrient sampling.
57/1	103	Phosphate	5	Water dumped from Niskin prior to nutrient sampling.
57/1	103	Silicate	5	Water dumped from Niskin prior to nutrient sampling.
57/1	104	Salinity	5	Salinity marked as sampled, but bottle was empty.
57/1	105	Nitrite	5	Water dumped from Niskin prior to nutrient sampling.

Station /Cast	Sample Number	Property	Quality Code	Comment
57/1	105	Nitrate	5	Water dumped from Niskin prior to nutrient sampling.
57/1	105	Phosphate	5	Water dumped from Niskin prior to nutrient sampling.
57/1	105	Silicate	5	Water dumped from Niskin prior to nutrient sampling.
57/1	106	Nitrite	5	Water dumped from Niskin prior to nutrient sampling.
57/1	106	Nitrate	5	Water dumped from Niskin prior to nutrient sampling.
57/1	106	Phosphate	5	Water dumped from Niskin prior to nutrient sampling.
57/1	106	Silicate	5	Water dumped from Niskin prior to nutrient sampling.
57/1	107	Nitrite	5	Water dumped from Niskin prior to nutrient sampling.
57/1	107	Nitrate	5	Water dumped from Niskin prior to nutrient sampling.
57/1	107	Phosphate	5	Water dumped from Niskin prior to nutrient sampling.
57/1	107	Silicate	5	Water dumped from Niskin prior to nutrient sampling.
57/1	108	Nitrite	5	Water dumped from Niskin prior to nutrient sampling.
57/1	108	Nitrate	5	Water dumped from Niskin prior to nutrient sampling.
57/1	108	Phosphate	5	Water dumped from Niskin prior to nutrient sampling.
57/1	108	Silicate	5	Water dumped from Niskin prior to nutrient sampling.
57/1	109	Nitrite	5	Water dumped from Niskin prior to nutrient sampling.
57/1	109	Nitrate	5	Water dumped from Niskin prior to nutrient sampling.
57/1	109	Phosphate	5	Water dumped from Niskin prior to nutrient sampling.
57/1	109	Silicate	5	Water dumped from Niskin prior to nutrient sampling.
57/1	117	Bottle	2	Nisk.17 fired at 257db vs 275db, operator error.
58/1	101	Salinity	3	Deep Salinity is -0.004 vs CTDS. Code questionable.
58/1	106	Salinity	3	Deeper Salinity is +0.05 vs CTDS, bottle/CTDO2 match. Code questionable.
58/1	117	f11	2	CFC syringe 474 changed out for 623 and re-sampled.
58/1	117	f12	2	CFC syringe 474 changed out for 623 and re-sampled.
58/1	117	n2o	2	CFC syringe 474 changed out for 623 and re-sampled.
58/1	117	SF6	2	CFC syringe 474 changed out for 623 and re-sampled.
58/1	120	he	5	He sample on 20 failed to seal; lost sample, then did not sample tritium.
59/1	101	Salinity	3	Deep Salinity is -0.0045 vs CTDS. Code questionable.
59/1	104	Salinity	3	Deep Salinity is -0.0035 vs CTDS. Code questionable.
59/1	106	Salinity	3	Deep Salinity is +0.004 vs CTDS. Code questionable.
59/1	112	Salinity	3	Salinity is +0.035 vs CTDS. Code questionable.
59/1	121	Salinity	3	Salinity is +0.07/+0.065 vs CTDS1/CTDS2. Code questionable.
59/1	124	O2	4	O2 value is 6.5 umol/kg high vs CTDO. O2 analyst: "no water seal over lid, bubble"
61/1	101	O2	3	O2 value is 2.5 umol/kg high vs CTDO (no analytical notes).
62/1	119	Refc.Temp.	3	SBE35RT reading is somewhat unstable, in a gradient. Code questionable.
62/1	119	Salinity	5	Salinity marked as sampled, but bottle was empty.
62/1	120	Refc.Temp.	3	SBE35RT reading is extremely unstable, in a gradient. Code questionable.
63/1	110	Refc.Temp.	3	SBE35RT reading is unstable for a deeper region. Code questionable.
63/1	111	Refc.Temp.	3	SBE35RT reading is unstable for a deeper region. Code questionable.
63/1	118	Refc.Temp.	3	SBE35RT reading is very unstable, in a gradient. Code questionable.
63/1	119	Bottle	3	Nisk.19 leaked again: bottom endcap caught a lanyard.
64/1	118	CTDT2	3	CTDT2 reading is extremely unstable, in a gradient. Code questionable.
64/1	118	Refc.Temp.	3	SBE35RT reading is extremely unstable, in a gradient. Code questionable.
64/1	118	TAlk	3	Value seems low? Sample reran and value is confirmed as a good measurement.
64/1	121	Bottle	2	Trip 21 had NO-confirm, then trip 22 re-triggered position 21 with a confirm. Salinity verifies closure occurred at NO-confirm level; other parameters were in a mixed layer.
64/1	122	Bottle	9	Nisk.22 came up open; Seasave log indicates it was skipped over / never triggered.
64/1	123	O2	3	O2 value is 25 umol/kg low vs CTDO (no analytical notes).

Station /Cast	Sample Number	Property	Quality Code	Comment
64/1	124	Bottle	2	Nisk.24 spigot had "squid guts" on it.
65/1	115	O2	4	loose cap let in some tap water
65/1	119	Refc.Temp.	3	SBE35RT reading is extremely unstable, in a gradient. Code questionable.
65/1	120	Refc.Temp.	3	SBE35RT reading is very unstable, in a gradient. Code questionable.
66/1	104	O2	4	floating cap
66/1	106	Salinity	3	Deep Salinity is +0.004 vs CTDS. Code questionable.
66/1	108	Salinity	3	Deep Salinity is +0.005 vs CTDS. Code questionable.
66/1	119	CTDT2	3	CTDT2 is very unstable, in a gradient. Code questionable.
66/1	119	Refc.Temp.	3	SBE35RT reading is very unstable, in a gradient. Code questionable.
66/1	122	O2	3	O2 value is 2 umol/kg high vs CTDO in mixed layer. O2 analyst: "a few odd points in graph".
66/1	122	Salinity	3	Salinity is +0.07/+0.06 vs CTDS1/CTDS2. Code questionable.
66/1	124	Salinity	3	Salinity is +0.035/+0.025 vs CTDS1/CTDS2. Code questionable.
67/1	102	O2	4	floating cap
67/1	116	O2	3	bad line of fit/low data points
68/1	105	Salinity	3	Deep Salinity is +0.015 vs CTDS, Bottle/CTD O2 values compare well. Code questionable.
68/1	108	Salinity	3	Salinity is +0.004 vs CTDS. Code questionable.
69/2	206	Salinity	3	Deep Salinity is +0.007 vs CTDS. Code questionable.
69/2	208	DIC	3	Sampled from niskin 9?
69/2	208	trit	1	salts sampled before tritium.
69/2	209	trit	1	salts sampled before tritium.
69/2	210	trit	1	salts sampled before tritium.
69/2	211	trit	1	salts sampled before tritium.
69/2	212	trit	1	salts sampled before tritium.
69/2	213	trit	1	salts sampled before tritium.
69/2	214	trit	1	salts sampled before tritium.
69/2	215	trit	1	salts sampled before tritium.
69/2	216	trit	1	salts sampled before tritium.
69/2	217	trit	1	salts sampled before tritium.
69/2	219	Refc.Temp.	3	SBE35RT reading is very unstable, in a gradient. Code questionable.
69/2	220	Refc.Temp.	3	SBE35RT reading is unstable, in a gradient. Code questionable.
70/1	101	Salinity	3	Deep Salinity is +0.0025 vs CTDS (bottom). Code questionable.
70/1	105	Salinity	3	Deep Salinity is +0.005 vs CTDS. Code questionable.
70/1	124	Bottle	3	Nisk.24 leaks with valve closed; gases and tritium not sampled. Top endcap reseated after sampling.
70/1	124	Salinity	4	Salinity is -0.04/-0.055 vs CTDS1/CTDS2, Nisk.24 leaks, but also in a large surface gradient. Code bad.
71/1	105	Salinity	4	Salinity is +0.01 vs CTDS, salt sample appears to be mis-drawn from Nisk.4, code bad.
71/1	115	Refc.Temp.	3	SBE35RT reading is very unstable, in a gradient. Code questionable.
71/1	124	Bottle	3	Nisk.24 leaks with valve closed; gases and tritium not sampled. Top endcap reseated after sampling.
71/1	124	Salinity	4	Salinity is +0.085/+0.12 vs CTDS1/CTDS2, Nisk. 24 leaks, but also in a high surface gradient. Code bad.
72/1	118	O2	2	Precipitate on lid of O2 flask 072.
72/1	119	Refc.Temp.	3	SBE35RT reading is very unstable, in a gradient. Code questionable.
72/1	120	Refc.Temp.	3	SBE35RT reading is very unstable, in a gradient. Code questionable.
73/3	304	O2	3	Deep O2 value is 1.5 umol/kg low vs CTDO (theta-o2); no analytical notes. Code questionable.
73/3	319	Refc.Temp.	3	SBE35RT reading is unstable, in a gradient. Code questionable.

Station /Cast	Sample Number	Property	Quality Code	Comment
74/1	101	O2	3	O2 value is 3 umol/kg high vs CTDO (no analytical notes).
74/1	102	Salinity	3	Deep Salinity is +0.005 vs CTDS. Code questionable.
74/1	103	Salinity	3	Deep Salinity is +0.003 vs CTDS. Code questionable.
74/1	105	Salinity	3	Deep Salinity is +0.011 vs CTDS. Code questionable.
74/1	114	DIC	2	See this in O2 and nuts also
74/1	116	Salinity	3	Salinity is +0.07 vs CTDS. Code questionable.
74/1	119	Refc.Temp.	3	SBE35RT reading is very unstable, in a gradient. Code questionable.
75/1	104	O2	3	Deep O2 value is 2 umol/kg low vs CTDO (theta-o2), no analytical notes. Code questionable.
75/1	106	Salinity	4	Deeper Salinity is +0.008 vs CTDS, appears to be a dup draw of Nisk.5. Code bad.
75/1	108	Salinity	3	Deeper Salinity is -0.008 vs CTDS. Code questionable.
75/1	109	Bottle	2	Squid guts on Nisk.9 spigot.
75/1	119	O2	2	Low oxygen noted at sampling time.
75/1	120	Refc.Temp.	3	SBE35RT reading is very unstable, in a gradient. Code questionable.
76/1	101	Salinity	3	Deep Salinity is +0.005 vs CTDS. Code questionable.
76/1	107	Bottle	2	Nisk.7 dripping slightly from spigot?
76/1	110	Salinity	3	Deeper Salinity is +0.008 vs CTDS. Code questionable.
76/1	118	Refc.Temp.	3	SBE35RT reading is unstable, in a gradient. Code questionable.
76/1	120	Refc.Temp.	3	SBE35RT reading is very unstable, in a gradient. Code questionable.
77/1	119	Refc.Temp.	3	SBE35RT reading is very unstable, in a gradient. Code questionable.
77/1	120	Refc.Temp.	3	SBE35RT reading is very unstable, in a gradient. Code questionable.
78/1	109	Salinity	3	Deep Salinity is +0.005 vs CTDS. Code questionable.
78/1	110	Salinity	4	Salinity apparently mis-drawn from Nisk.111. Code bad.
78/1	120	Refc.Temp.	3	SBE35RT reading is very unstable, in a gradient. Code questionable.
78/1	121	Refc.Temp.	3	SBE35RT reading is very unstable, in a gradient. Code questionable.
79/1	101	ph	2	pH on samples 1-3 had single head space, the rest double head space.
79/1	102	ph	2	pH on samples 1-3 had single head space, the rest double head space.
79/1	103	ph	2	pH on samples 1-3 had single head space, the rest double head space.
79/1	109	Salinity	3	Deeper Salinity is +0.006 vs CTDS. Code questionable.
79/1	110	Salinity	3	Deeper Salinity is +0.006 vs CTDS. Code questionable.
79/1	114	he	5	3He sample on Nisk.14 was lost.
79/1	118	O2	2	Endpoint recalculated
79/1	119	Refc.Temp.	3	SBE35RT reading is very unstable, in a gradient. Code questionable.
79/1	120	Refc.Temp.	3	SBE35RT reading is very unstable, in a gradient. Code questionable.
79/1	121	CTDT2	3	CTDT2 reading is extremely unstable, in a gradient. Code questionable.
79/1	121	Refc.Temp.	3	SBE35RT reading is extremely unstable, in a gradient. Code questionable.
79/1	124	Bottle	3	Nisk.24 leaks with valve closed; gases and tritium not sampled. Top endcap reseated after sampling.
79/1	124	Refc.Temp.	3	SBE35RT reading is somewhat unstable, in a large surface gradient. Code questionable.
79/1	124	Salinity	3	Salinity is -0.185 vs CTDS, in a large surface gradient. Code questionable.
80/2	221	CTDT2	3	Very unstable stop in a high gradient, omit ctdt2: not useful for calibration.
80/2	221	Refc.Temp.	3	SBE35RT reading is extremely unstable, in a gradient. Code questionable.
81/1	111	Bottle	2	Changed spigot O-rings before next cast; looking loose.
81/1	120	Refc.Temp.	3	SBE35RT reading is somewhat unstable, in a gradient. Code questionable.
81/1	121	Refc.Temp.	3	SBE35RT reading is very unstable, in a gradient. Code questionable.
81/1	124	Bottle	2	Changed spigot O-rings before next cast; looking loose.
82/1	119	Bottle	2	Nisk.19 spigot very tight, tough to open. Replaced inside O-rings on spigot before next cast.
82/1	120	Refc.Temp.	3	SBE35RT reading is unstable, in a gradient. Code questionable.

Station /Cast	Sample Number	Property	Quality Code	Comment
82/1	121	CTDT2	3	CTDT2 reading is very unstable, in a gradient. Code questionable.
82/1	121	Refc.Temp.	3	SBE35RT reading is very unstable, in a gradient. Code questionable.
83/1	101	Salinity	3	Deep Salinity is +0.018 vs CTDS. Code questionable.
83/1	120	Refc.Temp.	3	SBE35RT reading is unstable, in a gradient. Code questionable.
83/1	122	Refc.Temp.	3	SBE35RT reading is somewhat unstable, at the top of a gradient. Code questionable.
84/1	107	O2	2	or 110.779 written down
84/1	111	O2	2	or 51.901 written down
84/1	120	Refc.Temp.	3	SBE35RT reading is extremely unstable, in a gradient. Code questionable.
84/1	121	CTDT2	3	CTDT2 reading is very unstable, in a gradient. Code questionable.
84/1	121	Refc.Temp.	3	SBE35RT reading is very unstable, in a gradient. Code questionable.
85/1	102	Salinity	3	Deep Salinity is -0.0035 vs CTDS. Code questionable.
85/1	108	Salinity	3	Deeper Salinity is -0.007 vs CTDS. Code questionable.
85/1	109	Bottle	2	fired in error at same depth as Nisk.108. Adjusted depths for Nisk.10-11.
85/1	120	Refc.Temp.	3	SBE35RT reading is very unstable, in a gradient. Code questionable.
85/1	121	Refc.Temp.	3	SBE35RT reading is unstable, in a gradient. Code questionable.
86/1	107	Salinity	4	Deeper Salinity is +0.008 vs CTDS, appears to be a dup draw of Nisk.6. Code bad.
86/1	119	O2	2	Endpoint recalculated
86/1	120	Refc.Temp.	3	SBE35RT reading is very unstable, in a gradient. Code questionable.
86/1	121	Refc.Temp.	3	SBE35RT reading is extremely unstable, in a gradient. Code questionable.
86/1	124	O2	3	O2 value is 10 umol/kg high vs CTDO in surface mixed layer (no analytical notes).
87/2	203	DIC	3	Cell cap popped off during run, analysis questionable
87/2	204	DIC	4	Cell cap popped off during run, analysis bad
87/2	219	O2	2	Endpoint recalculated
87/2	220	Refc.Temp.	3	SBE35RT reading is very unstable, in a gradient. Code questionable.
88/1	115	O2	2	Endpoint recalculated
88/1	116	O2	2	Endpoint recalculated
88/1	118	O2	2	Endpoint recalculated
88/1	120	Refc.Temp.	3	SBE35RT reading is extremely unstable, in a gradient. Code questionable.
89/1	115	O2	2	Endpoint recalculated
89/1	116	O2	2	Endpoint recalculated
89/1	120	Refc.Temp.	3	SBE35RT reading is unstable, in a gradient. Code questionable.
90/1	118	TAlk	5	Instrument malfunction. Sample lost.
90/1	120	Refc.Temp.	3	SBE35RT reading is unstable, in a gradient. Code questionable.
90/1	121	O2	2	O2 value is 11 umol/kg high vs CTDO surface/bottom of mixed layer, no analytical notes. Seems to match down/up feature. Code acceptable.
90/1	121	Refc.Temp.	3	SBE35RT reading is very unstable, in a gradient. Code questionable.
90/1	124	Bottle	2	Jellyfish on spigot of Nisk.24.
91/1	111	he	5	3He sample on Nisk.11 lost (did not seal).
91/1	117	O2	2	Endpoint recalculated
91/1	119	Refc.Temp.	3	SBE35RT reading is very unstable, in a gradient. Code questionable.
91/1	120	Refc.Temp.	3	SBE35RT reading is very unstable, in a gradient. Code questionable.
91/1	120	TAlk	6	Seems high
92/1	109	Refc.Temp.	3	SBE35RT reading is unstable for a deeper region. Code questionable.
92/1	119	Refc.Temp.	3	SBE35RT reading is very unstable, in a gradient. Code questionable.
92/1	120	Bottle	2	Nisk.20 spigot donut broke while sampling nuts.
92/1	120	Refc.Temp.	3	SBE35RT reading is very unstable, in a gradient. Code questionable.
92/1	120	Salinity	2	Salinity is -0.14/-0.13 vs CTDS1/CTDS2. Value reported for Nisk.20 appears to be from Nisk.21; switched values in the database, Salinity is now ok.

Station /Cast	Sample Number	Property	Quality Code	Comment
92/1	121	Salinity	2	Salinity is +0.14/+0.15 vs CTDS1/CTDS2. Value reported for Nisk.21 appears to be from Nisk.20; switched values in the database, Salinity is now ok.
93/1	101	Salinity	3	Deep Salinity is +0.003 vs CTDS (at bottom). Code questionable.
93/1	104	Salinity	3	Deep Salinity is +0.01 vs CTDS. Code questionable.
93/1	107	Salinity	3	Deep Salinity is +0.015 vs CTDS. Code questionable.
93/1	108	Salinity	3	Deep Salinity is +0.0045 vs CTDS. Code questionable.
93/1	109	Salinity	3	Deep Salinity is +0.006 vs CTDS. Code questionable.
93/1	111	DIC	3	11 and 12 both drawn from niskin 12? 11 bad?
93/1	118	O2	4	O2 value is 21 umol/kg low vs CTDO, similar to next deeper o2 value (nisk.17); (no analytical notes) mis-draw?
93/1	119	Refc.Temp.	3	SBE35RT reading is very unstable, in a gradient. Code questionable.
93/1	120	Refc.Temp.	3	SBE35RT reading is very unstable, in a gradient. Code questionable.
94/1	108	Salinity	3	Deep Salinity is -0.005 vs CTDS. Code questionable.
94/1	109	Bottle	3	Nisk.8 lanyard caught in endcap of Nisk.9: leaker. Only nutrients sampled it.
94/1	113	DIC	3	12 and 13 both drawn from niskin 12? 13 bad?
94/1	120	Refc.Temp.	3	SBE35RT reading is very unstable, in a gradient. Code questionable.
94/1	121	DIC	3	Temperature bath failed, questionable analysis
94/1	121	Refc.Temp.	3	SBE35RT reading is unstable, in a gradient. Code questionable.
95/2	201	O2	3	O2 values approx. 2 umol/kg low vs nearby cast bottles on theta-o2 comparisons. Not close to CTDO until bottle 108-109 (2000-2500db).
95/2	202	DIC	4	Cell cap popped off during run, analysis bad
95/2	202	O2	3	O2 values approx. 2 umol/kg low vs nearby cast bottles on theta-o2 comparisons. Not close to CTDO until bottle 108-109 (2000-2500db).
95/2	203	O2	3	O2 values approx. 2 umol/kg low vs nearby cast bottles on theta-o2 comparisons. Not close to CTDO until bottle 108-109 (2000-2500db).
95/2	220	Refc.Temp.	3	SBE35RT reading is somewhat unstable, in a gradient. Code questionable.
95/2	221	Refc.Temp.	3	SBE35RT reading is very unstable, in a gradient. Code questionable.
96/1	102	pH	5	BROKEN BOTTLE
96/1	105	Salinity	3	Deep Salinity is +0.004 vs CTDS. Code questionable.
96/1	106	Salinity	3	Deep Salinity is +0.003 vs CTDS. Code questionable.
96/1	107	Salinity	3	Deep Salinity is +0.008 vs CTDS. Code questionable.
96/1	119	Refc.Temp.	3	SBE35RT reading is very unstable, in a gradient. Code questionable.
96/1	122	O2	4	O2 value is 15.5 umol/kg high vs CTDO in mixed layer. O2 analyst: "1 cm bubble".
97/1	101	O2	4	O2 value is 16 umol/kg high vs CTDO. O2 analyst: "stir bar off during titration".
97/1	101	Salinity	3	Deep Salinity is +0.0025 vs CTDS (at bottom). Code questionable.
97/1	106	Salinity	3	Deep Salinity is +0.014 vs CTDS. Code questionable.
97/1	108	Salinity	3	Deep Salinity is -0.005 vs CTDS. Code questionable.
97/1	109	Salinity	3	Deep Salinity is +0.006 vs CTDS. Code questionable.
97/1	113	he	5	3He failed to seal; lost sample.
97/1	122	he	5	3He failed to seal; lost sample.
98/1	104	Salinity	3	Deep Salinity is -0.003 vs CTDS. Code questionable.
98/1	108	Salinity	3	Deep Salinity is -0.0035 vs CTDS. Code questionable.
98/1	120	Refc.Temp.	3	SBE35RT reading is very unstable, in a gradient. Code questionable.
98/1	121	Refc.Temp.	3	SBE35RT reading is very unstable, in a gradient. Code questionable.
98/1	121	Salinity	2	Salinity is -0.075/-0.09 vs CTDS at trip, but matches CTDS in parts of the unstable sharp=-gradient stop. Code acceptable.
99/1	109	Salinity	3	Deep Salinity is +0.004 vs CTDS. Code questionable.
99/1	119	Refc.Temp.	3	SBE35RT reading is extremely unstable, in a gradient. Code questionable.
99/1	121	Refc.Temp.	3	SBE35RT reading is somewhat unstable, in a gradient. Code questionable.

Station /Cast	Sample Number	Property	Quality Code	Comment
99/1	122	O2	4	O2 value is 6.5 umol/kg high in surface mixed layer. O2 analyst: "best fit line bad - used avg of replicates".
100/1	101	Salinity	3	Deep Salinity is -0.003 vs CTDS. Code questionable.
100/1	103	Bottle	2	Nisk.3 fired "on its own" (w/o operator prompt) on-the-fly at 5200db. Data appear ok.
100/1	108	Salinity	3	Deep Salinity is -0.003 vs CTDS. Code questionable.
100/1	108	TAlk	2	Dickson HgCl2 pump failed; used DIC pump for 3 samples.
100/1	109	TAlk	2	Dickson HgCl2 pump failed; used DIC pump for 3 samples.
100/1	110	TAlk	2	Dickson HgCl2 pump failed; used DIC pump for 3 samples.
100/1	117	ph	2	Dickson HgCl2 pump failed; used DIC pump for 1 sample.
101/1	101	O2	2	O2 Flask 053 value is 1.5 umol/kg high vs CTDO/deep, no analytical notes. Flask 054 replicate agrees well. Used flask 054 value, code acceptable.
101/1	116	c13	1	Sample Bottle has no number for 13C/14C-DIC. Called it "A".
101/1	119	Refc.Temp.	3	SBE35RT reading is unstable, in a gradient. Code questionable.
101/1	121	Refc.Temp.	3	SBE35RT reading is unstable, in a gradient. Code questionable.
102/1	101	Salinity	3	Deep Salinity is +0.005 vs CTDS. Code questionable.
102/1	104	O2	3	O2 value is 3 umol/kg high/deep vs CTDO (no analytical notes)
102/1	105	Salinity	3	Deep Salinity is +0.0045 vs CTDS. Code questionable.
102/1	106	Salinity	3	Deep Salinity is +0.003 vs CTDS. Code questionable.
102/1	108	Salinity	3	Deep Salinity is -0.004 vs CTDS. Code questionable.
102/1	118	Salinity	3	Salinity is +0.26 vs CTDS. Code questionable.
102/1	121	Refc.Temp.	3	SBE35RT reading is unstable, in a gradient. Code questionable.
102/1	124	Bottle	3	Nisk.24 leaky: badly seated O-ring, re-seated. Gases not sampled, only nutrients and salinity.
103/2	204	Salinity	3	Deep Salinity is +0.007 vs CTDS. Code questionable.
103/2	208	Salinity	3	Deep Salinity is +0.010 vs CTDS. Code questionable.
103/2	212	DIC	4	Cell cap popped off, bad analysis
103/2	218	Refc.Temp.	3	SBE35RT reading is unstable, in a gradient. Code questionable.
104/1	101	Salinity	3	Deep Salinity is +0.0055 vs CTDS. Code questionable.
104/1	109	Salinity	3	Deep Salinity is +0.0045 vs CTDS. Code questionable.
104/1	117	Salinity	2	Salinity is +0.45 vs CTDS. Value reported for Nisk.17 appears to be from Nisk.18; switched values in the database, Salinity is now ok.
104/1	118	Salinity	2	Salinity is -0.45 vs CTDS. Value reported for Nisk.18 appears to be from Nisk.17; switched values in the database, Salinity is now ok.
104/1	119	Refc.Temp.	3	SBE35RT reading is very unstable, in a gradient. Code questionable.
105/1	114	O2	2	O2 Flask 68: added first reagent, put cap in, removed, added second reagent, replaced cap - no bubble.
105/1	117	Refc.Temp.	3	SBE35RT reading is very unstable, in a gradient. Code questionable.
105/1	118	Refc.Temp.	3	SBE35RT reading is unstable, in a gradient. Code questionable.
105/1	120	CTDT2	3	CTDT2 is -0.035 deg.C vs SBE35RT/CTDT1. Code questionable.
106/1	121	O2	3	O2 value is 5 umol/kg high vs CTDO (no analytical notes)
107/1	107	Salinity	3	Deep Salinity is +0.0035 vs CTDS. Code questionable.
107/1	108	Salinity	3	Deep Salinity is -0.005 vs CTDS. Code questionable.
107/1	116	Refc.Temp.	2	SBE35RT reading is stable; single dropped character in SBE35RT value is likely the first decimal place in T. Changed raw file from 6.56138 to 6.956138. Code acceptable.
107/1	121	Refc.Temp.	3	SBE35RT reading is very unstable, in a gradient. Code questionable.
108/2	201	Salinity	3	Deep Salinity is +0.004 vs CTDS. Code questionable.
108/2	204	Salinity	3	Deep Salinity is +0.0035 vs CTDS. Code questionable.
108/2	206	Salinity	3	Deep Salinity is +0.0045 vs CTDS. Code questionable.
108/2	207	Salinity	3	Deep Salinity is +0.004 vs CTDS. Code questionable.

Station /Cast	Sample Number	Property	Quality Code	Comment
108/2	216	Bottle	2	CFC changed out syringe 290 for 761 during sampling.
108/2	217	Refc.Temp.	3	SBE35RT reading is very unstable, in a gradient. Code questionable.
108/2	224	Salinity	3	Salinity is -0.225/-0.22 vs CTDS1/CTDS2, in surface mixed layer. Code questionable.
109/1	101	Salinity	3	Deep Salinity is +0.011 vs CTDS. Code questionable.
109/1	106	Salinity	3	Deep Salinity is +0.003 vs CTDS. Code questionable.
109/1	109	Salinity	3	Deeper Salinity is +0.003 vs CTDS. Code questionable.
109/1	112	Salinity	3	Salinity is +0.02 vs CTDS. Code questionable.
109/1	113	Bottle	2	Nisk.13 spigot half pushed in, but not leaking.
109/1	115	TAlk	3	Seems high. Value confirmed with rerun
109/1	117	Refc.Temp.	3	SBE35RT reading is very unstable, in a gradient. Code questionable.
109/1	118	Refc.Temp.	3	SBE35RT reading is very unstable, in a gradient. Code questionable.
110/1	103	O2	2	O2 Flask 107 value is 5 umol/kg low vs CTDO, Flask 108 replicate agrees well. Used flask 108 value, code acceptable.
110/1	105	O2	2	O2 vs CTDO indicates flask 110 from nisk. 5 was run second/out of order. Orig. data file revised. Code acceptable due to good agreement with CTDO after switch.
110/1	106	O2	2	O2 vs CTDO indicates flask 111 from nisk. 6 was run first/out of order. Orig. data file revised. Code acceptable due to good agreement with CTDO after switch.
110/1	121	Refc.Temp.	3	SBE35RT reading is somewhat unstable, in a gradient. Code questionable.
111/2	207	Salinity	3	Deep Salinity is +0.008 vs CTDS. Code questionable.
112/1	101	Salinity	3	Deep Salinity is +0.003 vs CTDS. Code questionable.
112/1	103	Salinity	3	Deep Salinity is +0.0035 vs CTDS. Code questionable.
112/1	108	TAlk	3	A little high. Value confirmed with rerun.
112/1	109	TAlk	3	A little high. Value confirmed with rerun.
112/1	118	Bottle	2	Nisk.18 was sampled by chlorophyll before TAlk.
112/1	119	Refc.Temp.	3	SBE35RT reading is very unstable, in a gradient. Code questionable.
112/1	120	Bottle	3	Nisk.20 leaking "like a sieve" from bottom endcap. Gases not sampled, only chlor, nutrients and salinity.

References

Joyc94.

Joyce, T., ed. and Corry, C., ed., “Requirements for WOCE Hydrographic Programme Data Reporting,” Report WHPO 90-1, WOCE Report No. 67/91 ., pp. 52-55, WOCE Hydrographic Programme Office, Woods Hole, MA, USA (May 1994, Rev. 2).